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Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 33 JANUARY, 1920 No. 1

Buy Government Houses and Take Them Home by Tractor

TO SELECT a dwelling from a large stock of samples, buy it "over the counter" at a bargain price, and then pack it on a motor truck to be sent home, is a novel solution of the house-hunting problem. That is literally what has been happening recently, however, in a number of communities where munition-plant housing facilities are being dismantled by the government. All the purchaser needs is a vacant lot, of course, and a foundation for his new home.

Near Cincinnati more than 200 four-room houses were sold in two days at the remarkable price of $200 each, their original cost to the government having been over $1,500. All the rooms in them are wainscoted to a height of five feet, and wallboarded above. Complete bathrooms are installed, as well as electric fixtures and wiring, plumbing for hot and cold water, and a capacious kitchen cabinet. Purchasers of these houses have been able to get concrete-block foundations built for an average price of $223, and to secure truck-and-trailer delivery within five miles for $130, making a total cost of $553 for a well-built home. As the little structures were already well painted outside, and finished inside in the natural wood, with two coats of good varnish, little remained for the purchaser to do, unless he wished to plaster or paper the upper side walls and ceilings, as an improvement on the wall board already provided. And the only terms of the sale were that the buyer remove his purchase within 60 days—a condition to which the weary hunter for nonexistent rent signs could offer no objection.

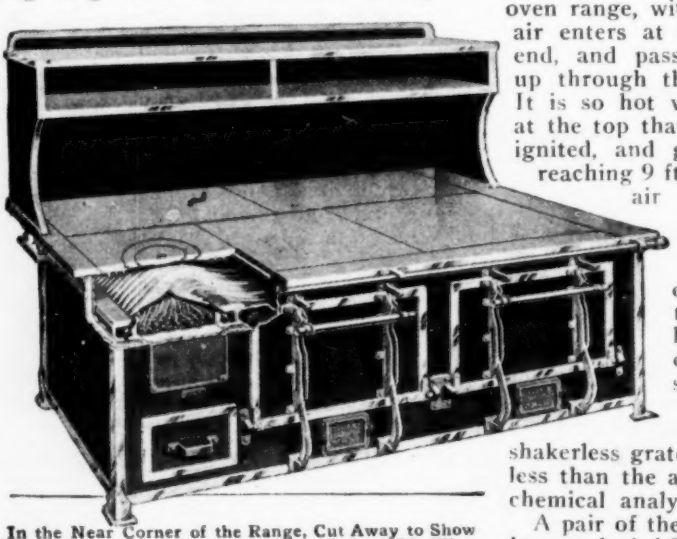
Taking the Purchase Home: The Little Houses were Easily Delivered to Their Buyers by Means of Motor Truck and Trailer

Typical Four-Room House Purchased from the Government and Supplied by the Buyer with a Concrete-Block Foundation, the Only Improvement Needed

¶ Carrying 12 passengers, the transatlantic seaplane "NC-4" recently flew without a stop from Pensacola, Fla., to Memphis, Tenn., a distance of 535 nautical miles.

REMARKABLE NEW COAL RANGE IS GAS AND COKE PRODUCER

In the present coal situation a cooking range that shows a fuel saving of something like 85 per cent will attract extraordinary attention. When, in addition, it consumes all its smoke and soot, and most of its ash, attention grows into wonder. Yet a new range—made, so far, only in hotel size—does just that. The secret lies in the use of superheated air for the draft. In the standard two-oven range, with the fire pit at one end, air enters at the bottom of the other end, and passes under the ovens and up through the hollow fire-box lining. It is so hot when it issues from holes at the top that the coal gas is instantly ignited, and great streamers of flame, reaching 9 ft. in length, burst from the air holes and run entirely around the ovens to the flue, passing the incoming air channels. This explains the preheating of the air. The coal, exhausted of gas, becomes coke and is further consumed, and nothing remains but an impalpable ash that falls through the shakerless grate. This residue is actually less than the amount indicated as ash in chemical analysis of the coal.



In the Near Corner of the Range, Cut Away to Show the Fire Box, the Superheated Air is Seen Distilling and Burning the Gas from the Coal, Producing Long, Intensely Hot Flames

A pair of the ranges in a Chicago hotel has cooked 1,900 meals, burning Illinois soft coal, at a fuel cost of only $1.40 a day. This is a saving of about $8 a day over the ordinary form of range. By firing every 2½ hours, the whole top of the range may be kept continuously red-hot.

AIRPLANE-HYDROPLANE MAKES 71 MILES AN HOUR

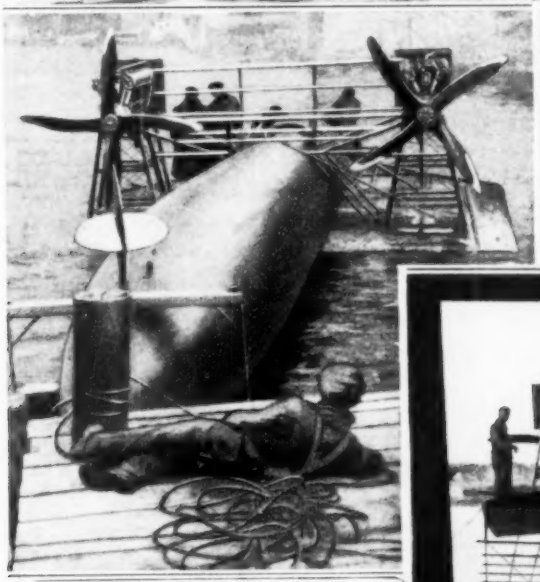
At 71 miles an hour, there skimmed over the surface of Little Bras d'Or Lake, in Nova Scotia, a few days ago, one of the most extraordinary watercraft ever built. Resting on its launching cradle before this notable trial trip, the strange hybrid was seen to consist of a cigar-shaped hull, or fuselage, about 30 ft. long, from the bow of which projected, monoplane-fashion, two heavy shortened wings. On a staging above each wing rested a 400-hp. Liberty engine, each fitted with a four-bladed pusher propeller. An airplane rudder surmounted the stern. Most curious of all were three ladderlike structures which extended downward from stern and wings—four slender, vertical arms holding seven narrow planing surfaces, or crosspieces, in each case. These units were of slight but very strong construction.

The trial trip was an almost startling success. When a speed of about 60 miles an hour was attained, the stubby wings took hold of the air, and raised the long hull clear of the water.

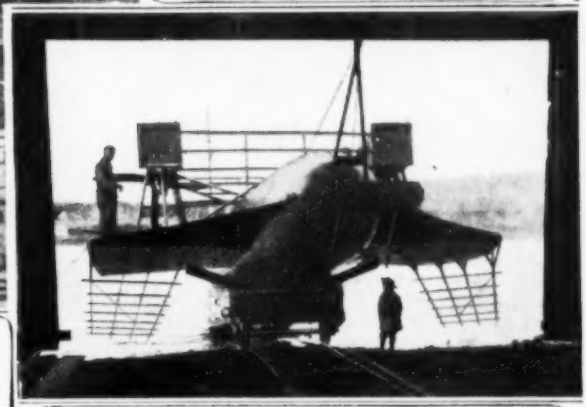
As more and more speed gradually was drawn from the two powerful engines, the craft stepped higher and higher. At 70 miles an hour it was riding a good three feet above the surface, with only the three lowest blades of each "ladder" in contact with the water. At this speed, too, the vibration and lurching associated with the ordinary seasled were oddly missing; the craft rode as smoothly as a limousine on a city boulevard.

Radical in design though it is, the sensational creation cannot fail to win the attention of speed-boat designers everywhere, for the inventor is Dr. Alexander Graham Bell, the venerable American genius who 43 years ago patented the telephone. It is near Baddeck, on the shores of Little Bras d'Or, that Doctor Bell has his summer home.

On the Inland Waters of Cape Breton Island, Nova Scotia, Not Far from His Summer Home, Dr. Alexander Graham Bell Recently Put through Its Paces the "H04," Hybrid Offspring of the Airplane and the Hydroplane. The Doctor's Invention is Shown Above, as It Slipped Along with the Hull a Good Three Feet above the Surface



The System of Engine Mounting and Wing Support is Understood from This End-On View of the "H04." The Liberty Airplane Engines Turn the Two Four-Bladed Pusher Propellers. Just above the Post in the Foreground is Seen the Airplane Rudder



The "H04" is Here being Hauled, Bow First, into Its Shed. Silhouetted against the Waters of the Bay are Seen the Ladderlike, Vertical Structures That Alone Make Contact with the Water at Higher Speeds. A Third "Ladder" Projects from the Stern

From This Broadside View of the "H04" at Rest, It would Never be Imagined That the Craft Made 71 Miles an Hour on Its Trial Spin Pictured at the Top. Yet at That Speed, Terrific for a Watercraft, the Crew Rode in Absolute Comfort, Experiencing Neither Vibration nor the Disagreeable Lurching Sensation

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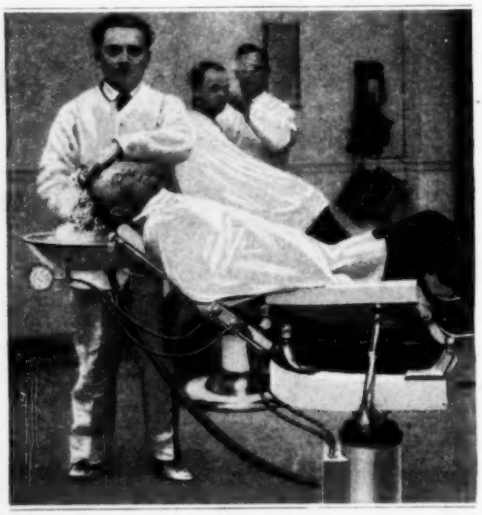
BARBERS' CHAIR ATTACHMENT PROVIDES HANDY BASIN

A means of combining a washbasin with a barbers' chair has been patented by an eastern inventor, who declares the



Washbasin Attachment for a Barbers' Chair: Hot and Cold Water are Supplied to a Spray Nozzle through Hose. A Flexible Drain is Provided

device will make it unnecessary for a patron to leave his seat while receiving a shampoo. Two vertical rods, attached to the back of the chair, and passed through friction grips in the rim of the basin, support the latter at different heights, or allow it to be lowered under the chair when it is not in use. A rubber hose serves as a flexible drain pipe for the basin. It is connected to the bottom of the vessel, and passed through the base of the chair. Hot and cold water are supplied to a spraying nozzle through other hose. Valves for regulating the flow of water are located in a convenient position on the side of the chair.

RUNAWAY ZEPPELIN GIVES PASSENGERS WILD RIDE

With 30 passengers in its comfortable cabin, the German air liner "Bodensee" sank, several weeks ago, toward its landing field, near Berlin. The regular trip from Friedrichshafen had been made without incident. Then everything went wrong. Unexpected air currents smashed the ship against the earth, breaking the cabin windows, disabling the engines, and extinguishing the lights. A puff from the side shoved the craft into the crowd of onlookers, killing one and maiming six. More "bumps" followed as the captain tried vainly to pass his mooring lines to the hangar crew below. Finally, an upward current seized the bag and tossed it high into the darkness. In the cabin the terrified passengers huddled together, half frozen, as the ship soared up and up. At one time a snowstorm enveloped them. Meanwhile, working feverishly, the mechanics repaired the engines, and after three hours of unguided flight the runaway was brought under control. Toward midnight the ship was landed in a grove of stunted fir trees, where it was found by astonished peasants in the morning.

ONE-MAN THREE-WHEEL AUTO IS POPULAR IN ENGLAND

It would hardly be possible to make a practical motor vehicle any smaller than one that is now coming into favor in England. There is just enough room on its three-wheeled chassis for one passenger and a 3-hp. engine. A tiller steers the two front wheels, while a slightly heavier rear wheel takes the drive. The little car is easy to handle in traffic, and extremely economical of fuel and tires, which accounts for its popularity just now, with these commodities so high-priced.

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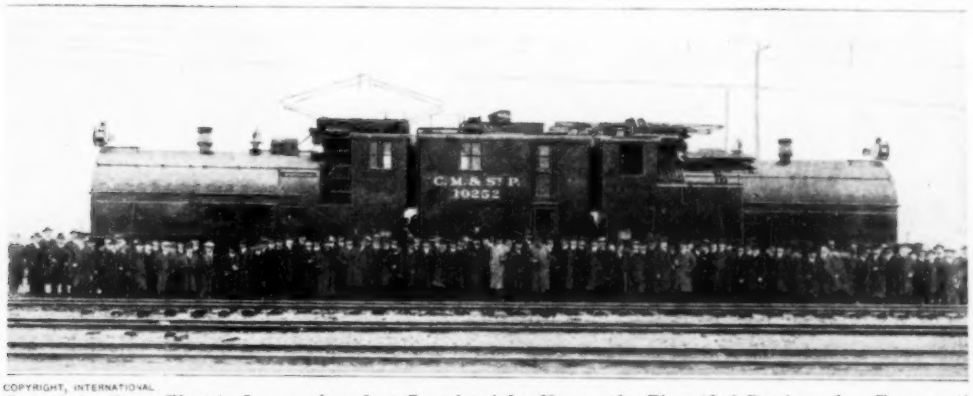
An English Three-Wheel Auto Reduced to Minimum Dimensions: There Is Just Room for the Engine and One Passenger



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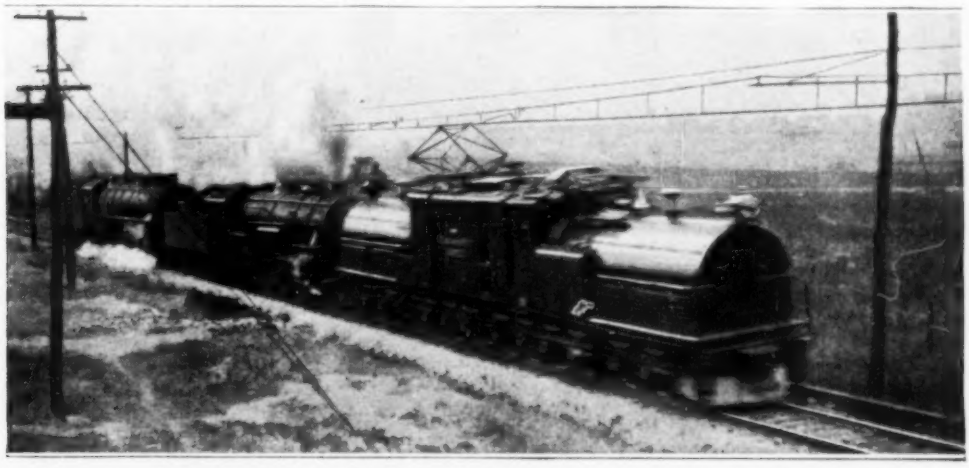
One of the Giant Electric Locomotives Just Completed for Use on the Electrified Portion of a Transcontinental Railway: It Is 78 Feet Long, Weighs 530,000 Pounds, and Has No Gears, Its 12 Motors being Mounted Directly on Its Axles, and Giving a Total of 2,760 to 3,240 Horsepower

ELECTRIC ENGINE WINS TUG OF WAR WITH STEAM

Pushed backward against their utmost pressure, two huge steam locomotives of modern type, immensely powerful, were decisively defeated in a Vulcanian tug-of-war contest with a single electric locomotive of new design, in a recent spectacular test at an eastern city. The electric, furthermore, gave its opponents a heavy handicap by allowing them to start first, gradually bringing them to a standstill as the current was turned on, and then driving them protestingly but surely the other way.

Five of these huge electric engines are being placed in passenger service on an electrified 440-mile stretch of the Pacific-coast end of a transcontinental railroad. The new machines are entirely gearless, 12 of their 14 axles having motor armatures mounted directly upon them, with a total of 2,760 to 3,240 hp. They weigh 530,000 lb., run on 3,000-volt direct current, and can make well over 65 miles an hour, hauling 12-car trains. For regenerative braking while coasting, four of the motors run as exciters for the other eight. An oil-burning, steam-heating plant for the passenger coaches occupies the center cab.

¶Only once during 20,750 miles of flying has one of their machines been forced to the ground by mechanical trouble, according to the recent report of a British company maintaining airplane service between London and Paris.



The Great Tug of War between the Electric and Two Huge Steam Locomotives, in Which the Electric Won, Actually Pushing Its Steam-Driven Opponents Backward against the Greatest Pressure They could Exert, after Allowing Them the Handicap of Starting First

The Little Power Schooner "Casco," Famous as the South Sea Home of Robert Louis Stevenson, Went to Pieces in Bering Strait on Its Way to the Gold Fields of Siberia with a Party of Adventurers. It is Pictured Imprisoned in the Ice Just Before It was Wrecked on the Rocks of King Island

MODERN ARGONAUTS COME TO GRIEF

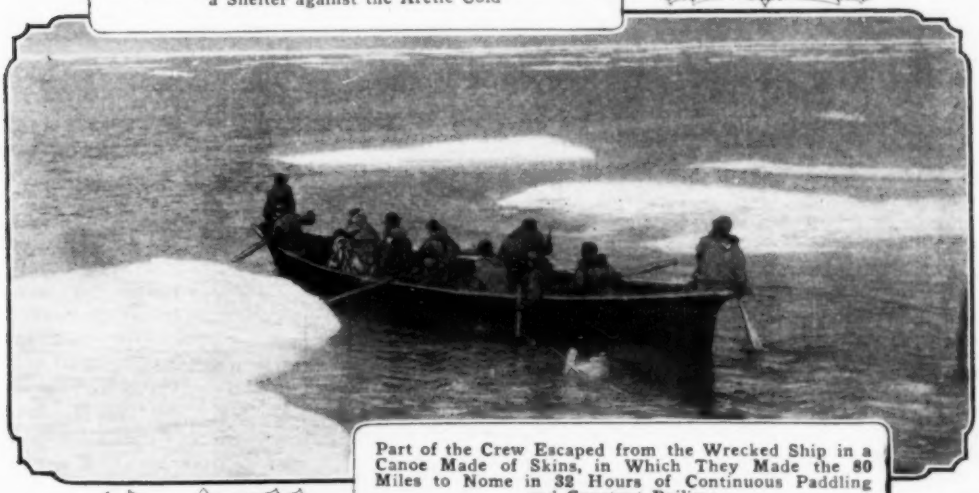
By LAWRENCE WILLIAM PEDROSE

SPURRED on by the same hopes which carried the gold seekers to California in the days of '49 and to the Klondike in '98, twelve adventurers boldly set forth, on June 1, 1919, from San Francisco, in the "Casco," the famous little power schooner which was Robert Louis Stevenson's home in the South Seas, their destination the fabled gold fields of Siberia. The "Casco" passed into the Arctic in July. On September 8th it became caught in the ice and, assailed by a northwest gale, was driven ashore, crashing upon the rocks of King Island, Bering Strait, between Alaska and Siberia. None of the crew was lost, although all suffered from the extreme rigor of the northland. They were rescued by the coast-guard cutter "Bear," and have returned to the States in search of another vessel.

The "Casco," on its last eventful voyage, succeeded in fighting its way westward as far as North Cape, reaching the farthest north of any vessel in the world last season. The destination of the gold seekers was the Kolyma River, in northeastern Siberia. The "Casco" was balked only by the unusual ice conditions of the year, the large frozen ice fields moving down earlier and in greater strength than usual.

Several times the little vessel was caught in the ice, but managed to escape. At North Cape it found the ice barrier impenetrable and

The "Casco" as It Lay Crushed against the Rocky Shore of King Island: The Crew are Salvaging Lumber and Supplies from the Little Craft Before It Sinks, to Build a Shelter against the Arctic Cold



Part of the Crew Escaped from the Wrecked Ship in a Canoe Made of Skins, in Which They Made the 80 Miles to Nome in 32 Hours of Continuous Paddling and Constant Bailing

All the Miscellaneous Materials Salvaged from the Wrecked Schooner Went into the Building of the Igloolike Shelter in Which the Part of the Crew on King Island Awaited Rescue — Tarpaulins, Canvas, and Lumber, with Rocks to Anchor the Roof against the High Winds

had to turn back in a wild race to escape into Bering Sea before the ice blocked Bering Strait, the only way out.

Several members of the expedition were left at North Cape, and three others were put ashore a short distance east of that place, to prospect for gold during the coming winter, and, if possible, to push on over the frozen sea to the Kolyma River.

The "Casco" gained Bering Strait after a great race with the ice, only to be flung ashore on the King Island rocks. At two o'clock, in the morning of September 10th, when ship and island were enshrouded in black night, it began to take water at a rate which showed its career was ended.

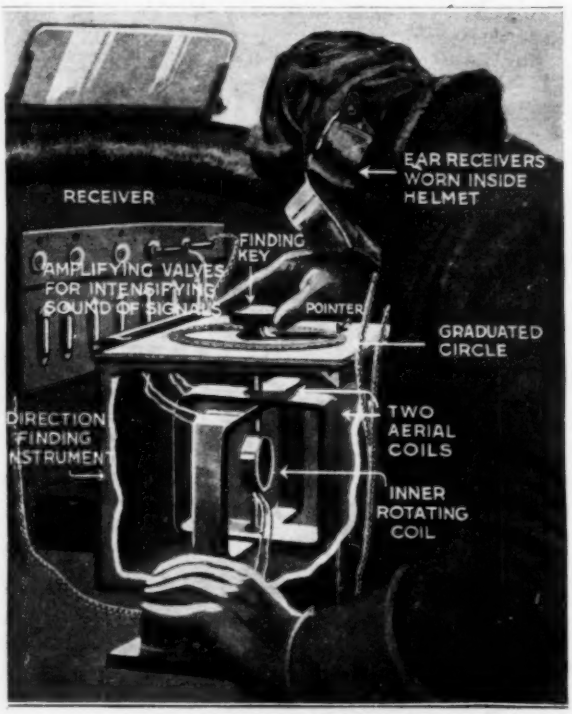
With the vessel going to pieces under their feet, the mate and members of his crew still left with the ship succeeded in saving the stores. The shipwrecked sailors lived in a deserted native hovel until they had built a house of their own from lumber salvaged from the "Casco." After remaining two weeks on the island the men set out in a snow squall in a tiny native "bidarka," or skin boat, and after 32 hours' incessant paddling, arrived at Nome, and were taken aboard the coast-guard cutter "Bear," which at once went to the rescue of the men left on King Island.

POLICE RESERVES SEEK WOMEN RECRUITS FOR AIR SCHOOL

A call for 30 women recruits between the ages of 18 and 25 has been issued by the office of the police reserves of New York City. As soon as 20 or more have volunteered, and passed physical and mental tests, they will be enrolled in the police department's aviation school, from which they will be graduated as an aviation corps to be attached to the women police reserve.

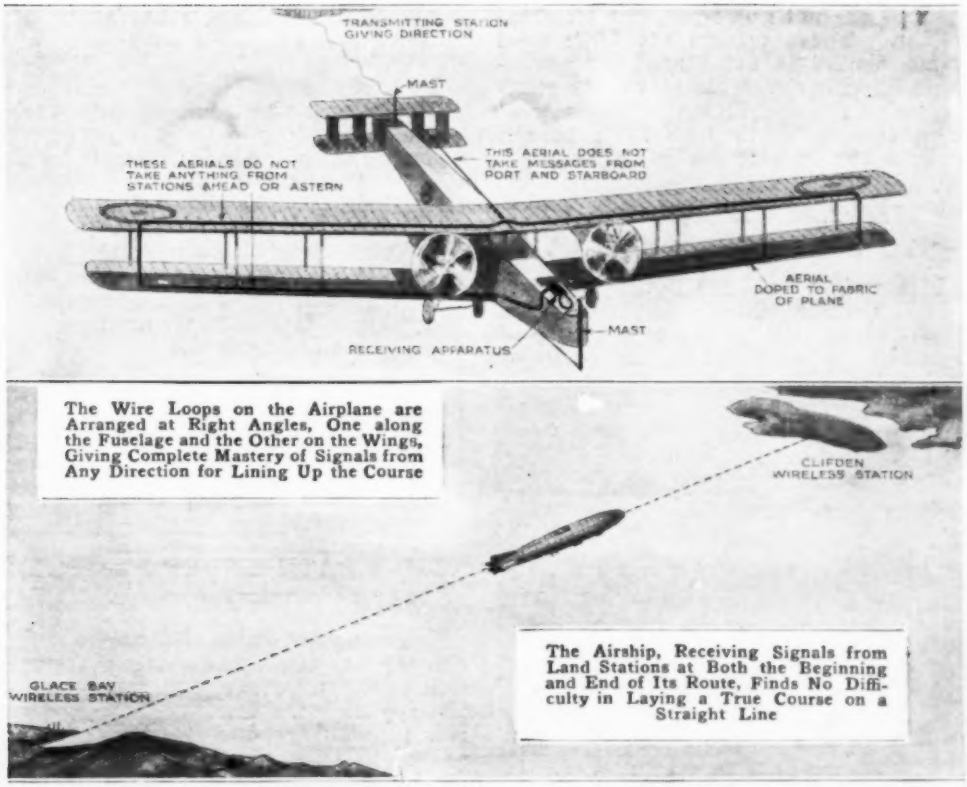
GUIDE SHIPS AND PLANES BY RADIO PATHFINDER

Navigation through fog and storm at sea, or along the unmarked paths of the air, is to be made a matter of mathematical exactness by the perfection of the wireless direction finder. The development of this new radio wonder already has progressed far enough to make that promise definite. The secret of the direction finder lies in the fact that a closed loop of wire, as a radio antenna, receives best in the position of its own plane, and is least effective at right angles. Such a loop, made by stretching a wire above and below the length of an airplane fuselage, receives most loudly in the direction of the plane's travel. A similar loop along the wings takes the signals coming from either side. The navigator's equipment is simply a pair of coils, fixed at right angles, and inside them a smaller coil, turned on a vertical axis by a hand knob, with a dial to indicate its position. By turning the knob until the signals from the



FROM THE SPHERE, LONDON. COPYRIGHT BY THE NEW YORK HERALD CO.

Wireless-Pathfinder Receiving Instrument: The Two Coils at Right Angles are Fixed, While the Little Detector Coil inside Them is Turned with a Knob, and Has an Indicating Dial, Which the Operator Reads When the Signals Are Loudest


TRANSMITTING STATION GIVING DIRECTION
MAST
THESE AERIALS DO NOT TAKE ANYTHING FROM STATIONS AHEAD OR ASTERN
THIS AERIAL DOES NOT TAKE MESSAGES FROM PORT AND STARBOARD
AERIAL DOPED TO FABRIC OF PLANE
MAST
RECEIVING APPARATUS
The Wire Loops on the Airplane are Arranged at Right Angles, One along the Fuselage and the Other on the Wings, Giving Complete Mastery of Signals from Any Direction for Lining Up the Course
CLIFDEN WIRELESS STATION
The Airship, Receiving Signals from Land Stations at Both the Beginning and End of Its Route, Finds No Difficulty in Laying a True Course on a Straight Line
GLACE BAY WIRELESS STATION

FROM THE SPHERE, LONDON. COPYRIGHT BY THE NEW YORK HERALD CO.

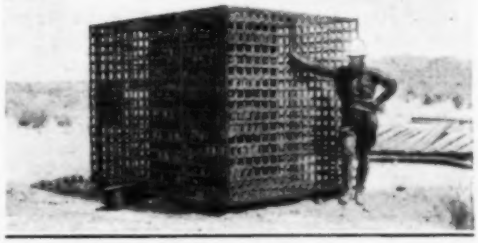
shore stations, at the beginning and end of his course, sound loudest in his head receiver, the airman or shipmaster determines, by a glance at the dial, how he is or should be headed.

USE HEAT RAYS FOR SIGNALS WITH SECRET WAR DEVICE

That signals can be transmitted and received with invisible heat rays, as successfully as with a beam of light, is demonstrated by the disclosure of a European signaling system used in the war. The transmitter is an electric arc, screened by a special black glass coated with peroxide of manganese, shutting off all visible rays but permitting the infrared rays to pass. The receiver is a parabolic mirror with a thermopile at its focal point, connected to a galvanometer. Messages were sent some 12 miles with this apparatus. It is proposed to use the receiver on shipboard to detect icebergs, and for this purpose, a sensitive galvanometer has been devised which is unaffected by the rocking of the ship.

RAILROADS USE STEEL CAGES TO IMPRISON TRAMPS

Drastic measures to prevent tramps from riding on trains that cross the southwestern deserts have been taken by



One of the Steel Cages Used by Southwestern Railroads as Prisons for Tramps Captured While Stealing Rides on Trains

four railroad companies operating in that section of the country. As part of a systematic campaign against hobos, prisons of an unusual sort have been established along the lines in thinly populated regions, where jails and police

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

stations are not numerous, nor close together. These prisons are large steel cages, similar to those used for confining wild animals. Tramps caught stealing rides are locked in the cages until it is convenient to take them to the nearest county seat for trial.

WHITE ANTS FORCE OIL MEN TO USE STEEL DERRICKS

Fire and storm have destroyed many an oil derrick of the traditional wood construction, but in the new oil fields of Trinidad, white ants and other insects of

Steel Oil Derrick Used in the New Fields on Trinidad Island to Prevent Destruction by Voracious White Ants

similar disposition are an even greater menace. So voracious is the appetite of these pests for pine, the usual derrick material, that the oil men have been forced to build all their derricks of steel. The great advantage of this construction in point of durability, however, is encouraging its use even where edibility is not a factor.

SCIENTISTS FORECAST USES FOR BY-PRODUCT OXYGEN

The growing production of artificial nitrate by atmospheric fixation, with oxygen as a by-product, is expected by many scientists to affect decidedly several industrial processes. Increased and cheaper production of this gas will permit a larger development of ozone, possibly the melting of gold-bearing quartz. It will increase the efficiency of the electric furnace, and probably result in the use of oxygen in metallurgical furnaces, enabling them to burn lower-grade fuels.

NEW TELEPHONE TRANSMITTER HAS SEPARATED GRANULES

Unusual sensitiveness and reliability are claimed for a new form of carbon telephone transmitter developed in France, primarily for portable instruments for the deaf, but equally applicable to regular telephone use. The "button" of the new microphone consists of a carbon disk about an inch in diameter, in the face of which are 220 or more tiny recesses. The carbon granules, instead of being carried in the usual loose mass, are arranged with one granule resting in the mouth of each recess. The diaphragm, of ordinary form, bears against all the granules. Such a transmitter, it is declared, never packs, and maintains a uniform efficiency. While most sensitive in the vertical position, when held horizontally it has remarkable power.

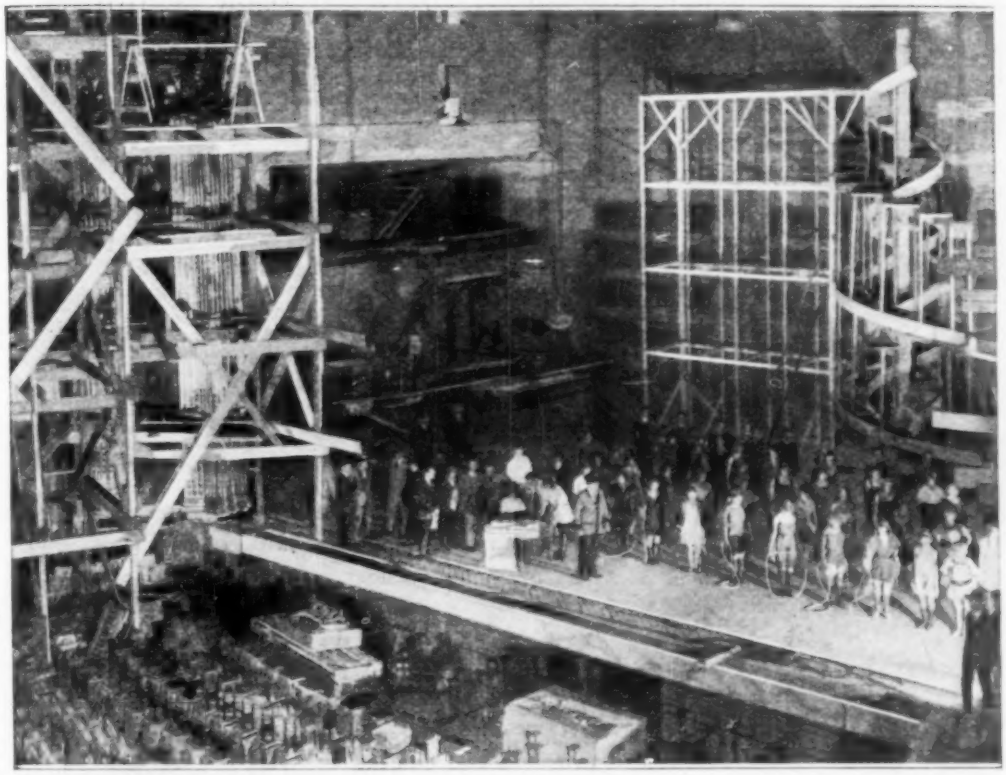
BRINE BATH UNDER PRESSURE SALTS PEANUTS IN SHELL

Peanuts salted in the shell are an agreeable novelty made possible by the invention of a new process and apparatus for its application. The raw peanuts first are soaked in brine, then placed in the patented pressure tank, where the salt is forced through the shell. Subsequently the nuts are baked in the usual way. The result of this process is a crisp, salted

After Their Bath in Brine, the Raw Peanuts are Placed in the Patented Pressure Tank at the Right. Here the Salt is Forced through the Shell and into the Kernel

kernel which stays fresh indefinitely, and, coming to the consumer in nature's own package, may always be depended upon to be clean

REHEARSALS IN UNFINISHED THEATER



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TO an accompaniment of pounding hammers and clattering scaffolding, chorus and principals recently rehearsed for many days in preparation for the opening of this mammoth New York theater. Its size is suggested by the fact that the orchestra floor, alone, seats nearly twice as many as the ordinary theater accommodates in orchestra, balcony, gallery, and boxes. From the architect's standpoint, the structure is noteworthy as containing one of the largest steel trusses ever used in an interior. The girder is 170 ft. long, weighs more than 100 tons, and carries the massive balcony without an intermediate support. In common with the rest of the structural steel used in the building, this great member was fabricated on the ground where the theater now stands. Though the builders found the mills closed to them because of the precedence given to war work, they went pluckily ahead, laying out, cutting, punching, and assembling every girder on the spot.

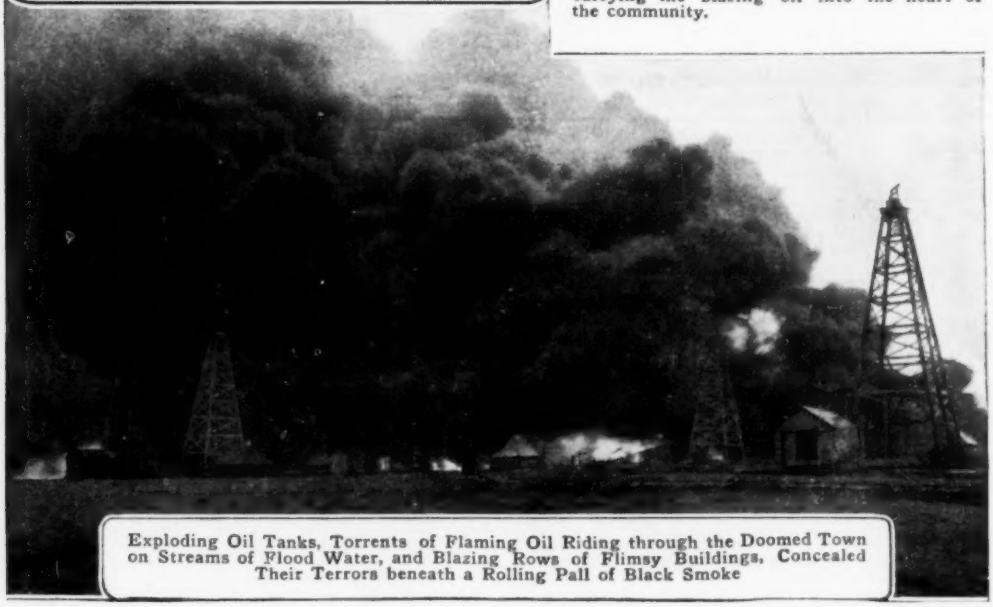
LIGHT RAYS BENT BY GRAVITY

Conclusions Drawn from Recent Solar Eclipse Have Profound Effect upon Philosophy of Space and Time

Long accepted theories of science are thrown into confusion by observations of the recent total solar eclipse, made by British astronomers. Apparatus was prepared and photographic exposures made for the purpose of testing the previously announced theory that light rays are subject to gravitational attraction, the subjects of study being seven stars close to the rim of the sun's disk. After making corrections for disturbances, the light rays from these stars were found to have been deflected 1.98 seconds in passing the sun, with a probable six-per-cent error. This deflection is twice the amount that accords with Newton's law. If these results are accepted as changing the theories of gravitation, Euclidian theories of space also will be affected. The discovery is regarded by scientists as of the first importance, and further observations are already planned for the next total eclipse in September, 1922. An eminent American authority, however, holds that the assumed bending of the light rays is simply refraction in passing through the solar atmosphere.

LIGHTNING AND FLOOD ASSIST HUGE OIL FIRE

LIGHTNING may not strike twice in the same place, but it struck once in two different places in the oil town of Waggoner City, Texas, last November, and started two simultaneous fires that came near ending the career of that flourishing community then and there. The general view of Waggoner City presented above was taken before the fire, and shows a remarkable settlement of more than 10,000 population, which has never been incorporated as village, town, or city, a typical oil center of mushroom growth. When the lightning struck, on both sides of the oil field at once, the district had just been visited by an unusual storm. The ditches at either side of the roads were flooded, and in some places water was flowing in the thoroughfare itself, as may be seen in the view of the main street at the left. It was this flowing water, usually fire's worst enemy, that assisted the destruction in this case by carrying the blazing oil into the heart of the community.



Exploding Oil Tanks, Torrents of Flaming Oil Riding through the Doomed Town on Streams of Flood Water, and Blazing Rows of Flimsy Buildings, Concealed Their Terrors beneath a Rolling Pall of Black Smoke

PHOTO COPYRIGHT, MCKAY & HERKIMER

IN BLOTTING OUT VAST AREA OF TEXAS TOWN

The Opposing Fires, Advancing from the Lightning-Struck Oil Tanks, Met in the Heart of the Business District, near the Bank, Practically Wiped Out the Section, and Then Proceeded through a Congested Cluster of Houses, Shacks, and Oil Wells, Driven by a Northerly Gale

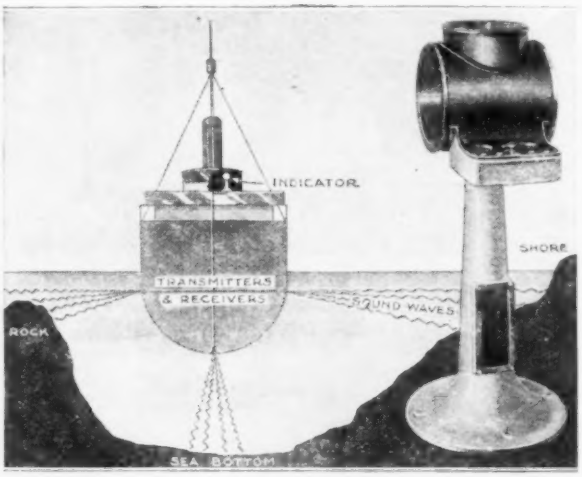
The Oil is Still Burning in the Ditches in This Picture, but Everything Solid That Was Combustible has been Consumed, in Spite of the Heavy Rain. Some 2,000 Men, Women, and Children, Deprived of All They Had, were Driven Out into the Deep Mud of the Rain-Soaked Fields

Though Some Operators Fought the Fire with Steam and Saved Their Properties, the Destruction Was Widespread, and the Losses Reported Over $1,000,000; but Almost Before the Smoke had Cleared Away, the Losers were Busily Planning to Rebuild and to Recoup Their Losses from the Unlimited Wealth of the Region

PHOTOS COPYRIGHT, MCKAY & HERKIMER

DANGERS OF SEA DECREASED BY REGISTERING SOUNDER

Tests that have been made with a new instrument for measuring depths and distances at sea, indicate that this apparatus in its improved form should prove of wonderful service as a safety device on seagoing vessels. It is believed that with this apparatus installed on vessels there will be no danger of ships going ashore or colliding with unseen objects in thick or foggy weather, as soundings can be taken at the rate of four a minute, no matter how fast the ship may be traveling.

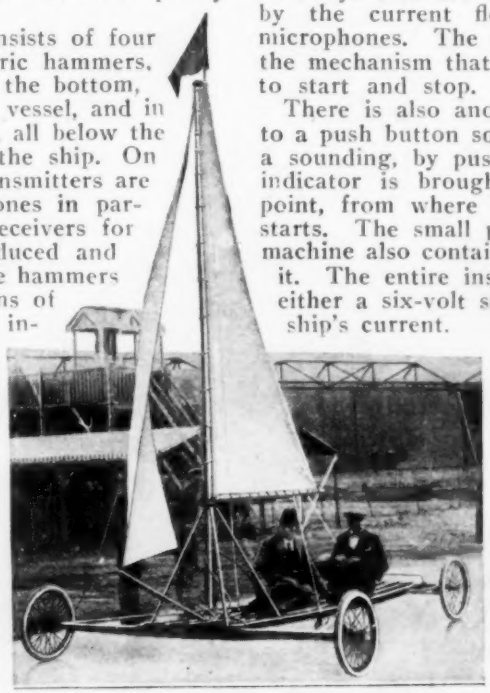


The Wavy Lines in the Diagram Represent the Sound Waves Sent through the Water by the Sounding Devices in the Ship, as Well as Their Return in the Form of Submarine Echoes. The Indicator is Seen on the Deck, and in Enlarged Detail at the Right

The installation consists of four transmitters, or electric hammers, one being located in the bottom, on both sides of the vessel, and in the bow, respectively, all below the mean water line of the ship. On either side of the transmitters are placed two microphones in parallel, which act as receivers for both the sound produced and the return echo. The hammers are operated by means of push buttons on the indicator, which is located either on the bridge or in the pilot house. Pressing the button which controls the transmitter in the bottom of the ship, causes a single blow to be struck at that point, which, by means of the microphones, starts the registering mechanism of the indicator moving. The sound produced by the blow travels through the water and strikes the bottom of the sea, or if any of the other hammers has been operated, the shore, or any submerged object, such as a rock, iceberg, or another vessel, and returns in the form of an echo. Striking the receivers the returning sound waves at once stop the indicator, and according to the time it takes the sound to travel forth and back, the indicator has moved a corresponding distance on the dial.

The receiving end, of course, consists of the two microphones and a number of relays that are electrically controlled by the current flowing through the microphones. The relays act to operate the mechanism that causes the indicator to start and stop.

There is also another relay connected to a push button so that, after receiving a sounding, by pushing this button the indicator is brought back to the zero point, from where the indicator always starts. The small panel in front of the machine also contains a switch to start it. The entire installation operates on either a six-volt storage battery or the ship's current.



The Sailing Buckboard, Light-Running and Tremendously Speedy, That is Giving an Airman Some New Thrills

SAIL WAGON THRILLS AIRMAN

Evidently seeking new thrills, and willing to take them on land, a noted British airman has built himself a vehicle that crosses the features of a buckboard with those of a catboat. It has four ball-bearing,

rubber-tired wheels that track widely, and a tall mast with quite a spread of canvas. Astonishing speed is attained by this contrivance.

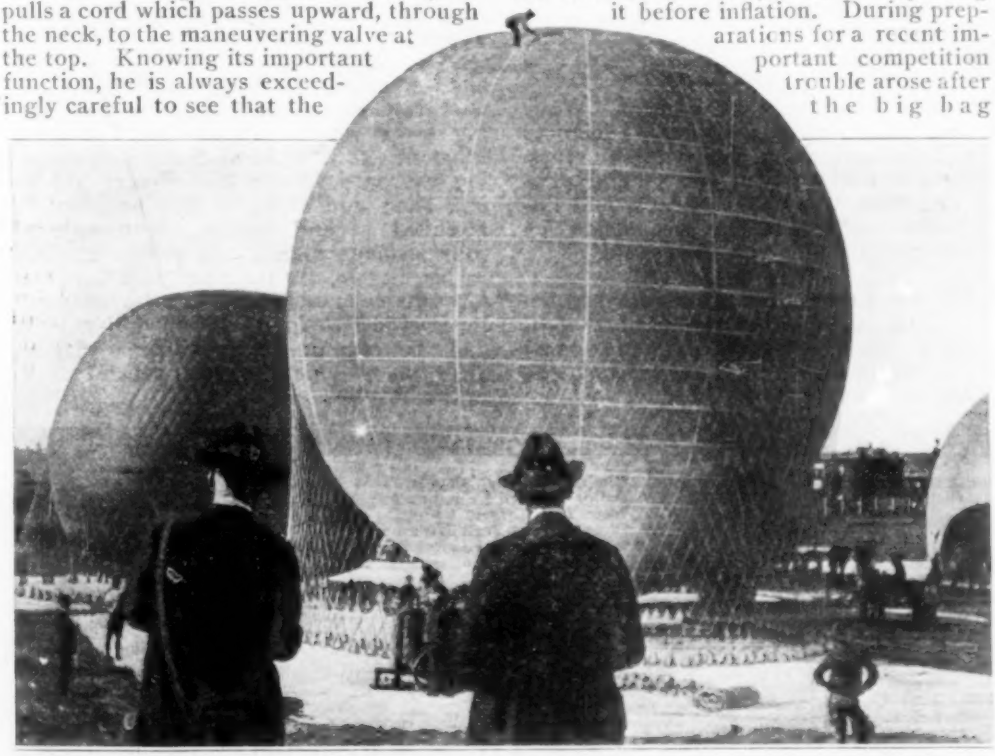
ELECTRIC FAN HELPS SELL MOTORING GOGGLES

A motorist usually buys goggles on faith, trusting to luck that they will exclude the wind and dust of the highway. Often they don't, as the pair that fits one face will not fit the next. One motor-supply house makes only satisfactory sales, however, by simulating actual road conditions. An electric fan is mounted on the display case where it can be turned on the face of the customer. In this way "leaks" are revealed at once, and the purchaser is able to make an intelligent choice from the large variety of goggles displayed.

If the Goggles do Not Fit, the Powerful Draft from This Electric Fan Reveals the Leak at Once and Warns the Prospective Purchaser to Try On Another Pair

MECHANIC CLIMBS BALLOON TO ADJUST VALVE

When the captain of a free balloon wishes to bring his craft to earth, he pulls a cord which passes upward, through the neck, to the maneuvering valve at the top. Knowing its important function, he is always exceedingly careful to see that the vital mechanism is in perfect order before the start of a cruise, usually inspecting it before inflation. During preparations for a recent important competition trouble arose after the big bag



The Slender Strands of the Covering Net Helped This Mechanic to Climb up the Side of the Balloon, Just before the Start of a Recent Competition. Reaching the Top, He was Supported Only by the Thin Fabric, a Puncture in Which might have Dropped Him into the Smothering Contents of the Bag

had filled. A mechanic was consequently forced to climb to the top, using as a ladder the slender strands of the covering net. He completed the repairs without accident, but not without danger, as a ripping of the thin fabric might have precipitated him into the smothering gas of the interior.

ODD UNSINKABLE ROWBOATS PLACED IN PUBLIC LAGOON

For the lagoon in old Battersea Park, London, have recently been bought a number of strange-looking boats, called

A Number of These Odd Pleasure Boats have been Placed on the Lake of a Famous London Park. They Are Uncapsizable and Nonsinkable and may be Used with Paddle, Oars, or Punt Pole

by their inventor dinghy-punts. They are best classified in this way, as features are borrowed from both these types. They are well adapted for general public use, also, being uncapsizable and unsinkable, and fitted for propulsion by either paddle, oars, or punt pole.

¶Chinese ring-necked pheasants are being used in New Jersey in the fight against Japanese beetles. While most birds refuse to eat these insects, the pheasants devour them greedily.

BRAZILIAN STATE DEVELOPS ANHINGA FIBER INDUSTRY

The commercial life of Para, Brazil, depends so essentially on the marketing of forest products that every effort is being made to advertise the value of a common native plant called "anhinga." In the soft beds of mud that line so many of the state's sluggish rivers, the plant grows so profusely that an estimated total of 100,000 tons could be exported annually. The anhinga is now known as the raw material from which cellulose is obtained for the manufacture of linen paper; but recent experiments show that the fibers may be transformed chemically into an artificial cotton fiber, of structure even superior to that of the genuine article. One mill is now busy with this new work, while efforts are being made to adapt abandoned sugar mills to the process.

PEDALS FROM COAST TO COAST CHAINED TO BICYCLE

Five months and 11 days after the handcuffs snapped about his wrists in Los Angeles, Calif., an ex-sailor presented himself to the mayor of New York City, who struck them off. With the handcuffs went the bicycle to which the adventurous youth had been chained during every minute of the long journey. Most of the time he had spent in pedaling eastward to win his wager; yet he had slept and eaten in the best hotels, attended several dances, even enjoyed four airplane flights, and always chained to his bicycle. As the handcuffs fell from his wrists he observed that he wouldn't repeat the trip for a million dollars. He had figured in innumerable accidents, after one of which he spent several weeks in the hospital.

Chained to His Bicycle, This Ex-Sailor Pedaled from Los Angeles to New York City in 5 Months and 11 Days. He is Seen Here on the Right before His Release

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COMMENT AND REVIEW

[These pages were printed November 25, 1919]

AFTER all is said, and after what has been done, and is trying to be done, the whole problem of reducing high costs for everything simmers down to a very simple explanation of only five words: Produce more or consume less.

Produce More or Consume Less

If farmers everywhere should produce twice as much as the world could consume, wheat and flour would soon be a drug on the market; or,

If the world should consume for, say, two years, only one-half of the wheat raised, then, too, would bread be cheap, and for want of storehouses to contain the surplus, the staff of life would become food for live stock.

The same reduction in selling price would be true of corn, potatoes, cattle, rails, overcoats, kid gloves, rubber boots, houses, automobiles, and all the rest.

With a cold winter ahead and a scarcity of nuts and acorns, the squirrels don't work half time or go on strike. On the contrary they hustle harder than ever. Squirrels know that quitting work neither increases the quantity of nuts, nor accumulates a reserve stock. And the higher the price of nuts in the squirrel market, the less they stop to chatter about it, and the longer and harder they work.

It is part of the price we pay for living outside a strip under the equator that we have to produce by work what we eat, and wear, and use. But who wants to live amidst malaria and venomous reptiles in order to wear palm leaves and have breadfruit drop into one's hands?

The merchants' shelves of the world are practically bone-bare. One goes to purchase a needed article and is obliged to take something one does not want, or wait an indefinite time for suitable goods, ordered months ago, to arrive. Is it not evident that greater production or decreased consumption, if indeed not both, is the only avenue of return to normal conditions? The first can only be accomplished by greatly intensified effort in every industry, and the second by individual, personal sacrifice.

RECOGNIZING the foregoing conditions, a group of wealthy men in England recently organized an Old Clothes Club, the evidence of membership in which consists in wearing garments which formerly would have been discarded, although far from being worn out. Thus a patch on coat or trousers becomes a badge of honor, and a suit long since out of style but otherwise perfectly good, a mark of distinction. With the rich wearing their old clothes, it is easy for those to whom the saving means much, to do the same. We in the United States may well emulate this sensible example. In fact the women of the country are already organizing for a remonstrance against the unreasonably high cost of gowns and hats.

Old Clothes Club

The women of America, if organized and once roused to action, are capable of accomplishing practically anything they undertake. The Women's Federation already has a national membership of over a million, and scarcely a town of any size in the country but boasts a local branch. Attorney-General Palmer, for the Government, is preparing to marshal the 30 million women of the land in an effort to resist high prices, not only of wearing apparel, but many other articles of necessity in the home. With all the women wearing out-of-date hats, naturally no one feels any embarrassment in doing so. Once the demand for things slackens, both manufacturers and retailers will find a way to moderate prices.

In this connection it is interesting to note that it is not so much the wealthy as a class who are paying exorbitant prices, but instead those who only a few months ago wanted to buy as cheaply as possible. An instance of which I happen to know will illustrate. A few days ago a well-known hatter, in business many years, had for his first customer that day a long-time patron who formerly bought only the highest-priced hats, and who could afford anything he wished. He came in to purchase a new hat, and was offered one at $15. He

refused even to try it on, and likewise others at less price, until the dealer offered one at $6, which he bought. A little later appeared a man who evidently was engaged in some manual labor. He indignantly rejected the $6 hat, likewise one at $10 and $12. Finally he said, "Wot you think I am? I got money; show me a good one." His "lid" cost him $15. And finally came a colored man who asked for something swell, and, pointing out one he saw, cheerfully paid $20. A friend of mine who wanted an inexpensive raincoat was first shown one at $35, which he refused. "Have you nothing less?" They had, and he was successively shown from one table to another, and finally landed on a lot at $15, which he bought. "What's the matter with this coat?" he asked the clerk. "Why, nothing," he replied. "I wear one of them myself, but everybody wants the highest-priced ones." The difference in both looks, quality and durability of the various coats was, in this case, all out of proportion to the difference in price.

On account of high wages, and high prices, people seem to accept the latter as inevitable and fail to save, often even where they could.

ONE of the surest ways, however, to pull down prices is for each one to work faster, when he works. It cannot be denied that the effect of largely increased wages (disregarding the high cost of living) has been generally to somehow create a desire to do less than the old-time, normal effort. The shortage of both men and women, in all occupations, has made employes of all classes feel that they could do less and get away with it. If the boss didn't like their work, they could easily get another job, and so they could. But this is taking advantage of a condition which doesn't get anybody anywhere in the long run. Instead of shirking and slacking, how vastly better for our own country, the world, and for ourselves individually to roll up our sleeves and tackle the proposition of restocking the world with that magnificent spirit which carried our boys over the top in France. With peace came a tremendous relaxation of strained effort and nerves, and the pendulum of our effort naturally swung too far the other way. Now, it's time to get back to a sane medium; in other words, pre-war effort. If we can only do this, and all the other countries of the world, we will once more be able to think and work normally, and we shall all be happier and vastly better off. The mere receiving of so much money for so many hours in this place or that is not alone the highest motive; it is well worth while to feel each night that we have done our bit, have contributed our part that day toward restoring the world to its former condition; and if in the doing we can make it even better than ever before, the greater the satisfaction.

We should Do More

AN interesting letter today from a young woman in Florida says: "I am a girl of 16 who will have to earn her own living in about two years—maybe less. I like all kinds of boy's work, especially machinery and cabinet woodworking, which I have taken up for three years. I have also had mechanical drawing for two years, and am now taking machine drawing. Is there any demand for a girl in this kind of work?"

Women Become "Draftsmen"

Indeed there is. Already some of the largest manufacturing concerns in the country have discovered the advantage of employing in their drafting department such young women as have a natural inclination toward mechanical subjects and have fitted themselves for the work. Thus far their work has been supplemental; transferring or filling in plans laid out by men more experienced. One department manager says: "In our case their work is neat, rapid and accurate; they are less apt to waste time than the young men. Of course, we can never tell when they will marry and leave us, hence as a class they are less to be counted on for the more important work which requires years of training and experience. But what they do, they do well.

To those young women who prefer mechanics to teaching and the other established occupations now chiefly filled by women, the drafting room offers an attractive field, with good pay.

Saving Wasted Energy

NOT in your day or mine, and it seems a long way off, but eventually all the wood and coal and oil in the world suitable for fuel, will have been exhausted. It is unthinkable that the people living here will have to perish from cold, or eat uncooked foods. They will not, for inventive genius will have anticipated the crisis and gathered light and warmth from the air and sea. Nothing but the abundance and nearness of coal and oil has prevented the working out of this problem before this time.

The heatless days during the war, and now the coal strike, will surely direct attention to the problem, and in all probability there are those living today who will witness its solution. Nature has been prodigal in providing forests, and these are almost gone; also coal and oil, and both are being used up at a rapid and ever-increasing rate. But she has yet in reserve forces far greater, which ages will not exhaust—tides and solar heat. The possibilities of heating, which include light and power, in these two elements are so vast that all the coal in the world is but a handful of kindling wood to a great conflagration.

Harnessing the tides has thus far been tried with a little success here and there, but the practical, universal tide motor is yet to emerge from some inventor's mind. It may not come for 10, 20, or even 50 years, but some day we shall find it, and when we do it will doubtless be different from any we have tried thus far.

And the millions of horsepower beating down upon desert and plain, and in the tropics, only to rebound into the air, like a bird calling to his mate but receiving no answer, some day will be caged and released as needed, to serve humanity.

However, the use to any extent of solar and tide power is conditioned upon other inventions, which can distribute the power thus made. This involves storage and transmission, the latter a distance of a thousand miles where it is now a hundred. Fame and wealth deservedly await those who shall work out these inventions, or discoveries, in a practical way.

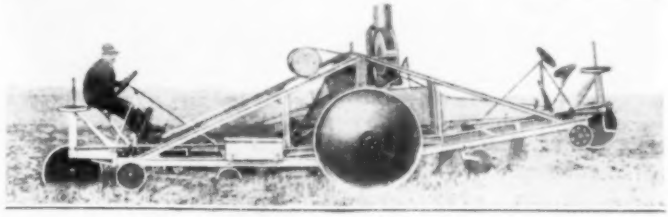
In the meantime the wonder is that cities within, say, 300 miles of coal mines are not already supplied with gas for heating and electricity for lighting, from plants located at the mines. The saving would be staggering, doing away with railroad shipment of the coal, unloading and hauling at destination, shoveling into boilers and furnaces, and finally the removal and disposal of the ashes. Incidentally, the yearly saving in the material things which are harmed or ruined by smoke from soft coal would amount to hundreds of millions of dollars, and the health of these communities would be greatly improved.

Power made at the mouth of the mine would be the last word in its economical production with steam engines and turbines.

H. H. WINDSOR

FRENCH TRACTOR GOES FORWARD OR BACKWARD

"Built like a bridge and balanced like a seesaw" might well be the catchline announcement of a peculiar tractor now popular in French farming districts. The long steel frame balances on the engine-driven ground wheels in the middle, and has duplicate sets of cultivating implements and a driver's seat at either end. Instead of turning around, the driver simply changes seats and reverses the engine, his weight bringing the occupied end into contact with the ground. The two sets of implements only do the work of one, but this objection is regarded as offset by the time and ground space saved in turning the machine around.



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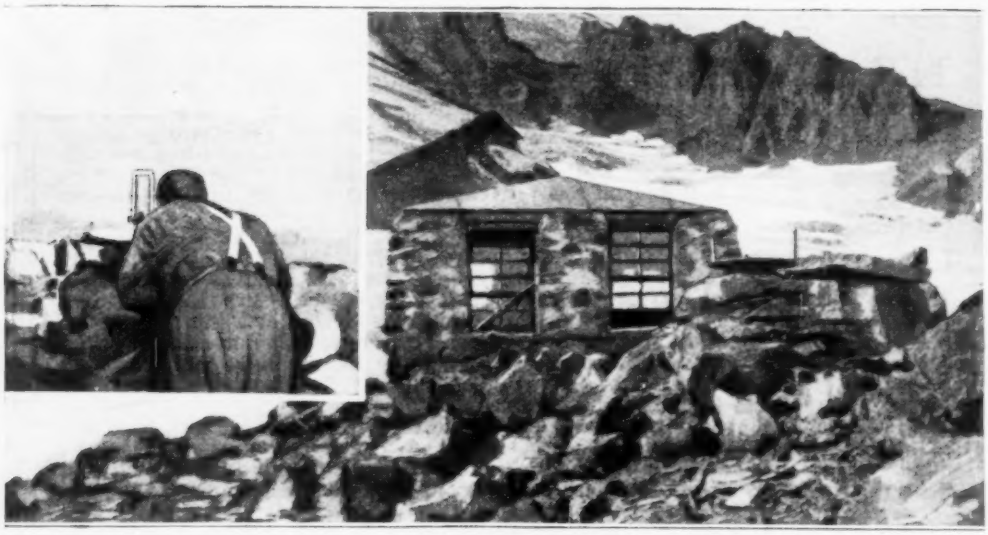
French Tractor Which is Never Turned Around: The Driver Merely Changes Ends and Reverses the Engine, the Frame being Balanced on the Two Central Driving Wheels



Mount Rainier Fire Ranger's Cabin, Built of Native Stone Because Timber Was Not Available at Such an Altitude: Even the Ranger's Instruments are Set on a Solid Stone Table, as the Insert Shows

CAST-IRON BURIAL CASKET MYSTERY OF ANTIQUITY

An archæological mystery was unearthed in the Louisiana swamps a short time ago, when two negro hunters found an ancient coffin, made wholly of cast iron. The folds of a shroud are skillfully imitated in the metal, while at the feet is an hourglass design, and at the breast space for a nameplate. The head has an octagonal window opening, and the upper and lower halves are united by 15 cap screws, and have tongue-and-groove edges. There is little mention of metal burial caskets in the history of burial customs.

FIRE RANGER'S STONE CABIN IS ABOVE TIMBER LINE

For the cabins of fire rangers, the mountain lookout stations of the U. S. Forest Service, the standard material is lumber, and they are made more or less according to one set of plans. The Mt. Rainier station, however, is an exception. Its site amid rocks and snow is far above the timber line, and hoisting lumber up to it was a discouraging prospect. So the cabin was built of stones, gathered on the spot, and only cement was hauled up, melted snow supplying the water. The finished cabin is completely weatherproof, a highly effective shelter, and a huge rock pile outside the door makes a solid table for the ranger's telescope, range finder and map.

NOVEL LAMP SHADE PROVIDES MOVABLE REFLECTORS

A new adjustable lamp shade is designed to reflect the light produced by an electric bulb in various directions to suit different needs. Two hollow quarter-spheres, made from sheet metal, are pivoted on a bracket that fastens on the socket. These can be drawn together to form a reflector over, under, or on either side of the lamp, or they can be separated to provide shades on both sides. The parts are held in position by thumbscrews at the joints.

Adjustable Lamp Shade: The Reflectors are Shown in Four Different Positions on an Electric Droplight

KOREAN METAL TYPE OF 1403 NOW IN AMERICAN MUSEUM

Whatever the true origin of movable metal types, it is now definitely known that Korea used them as early as 1403, years before Europe's earliest claims. Specimens of these types now have a place in the American Museum of Natural History. They are in Chinese characters, Korea at that time being under the protection of China. In use, the type was set in a beeswax bed, a cylindrical concavity in the base assisting adhesion. Impressions were taken much as a modern printer "pulls proof," the faces being inked with a brush, and the paper pressed down on the type with a felt cushion.

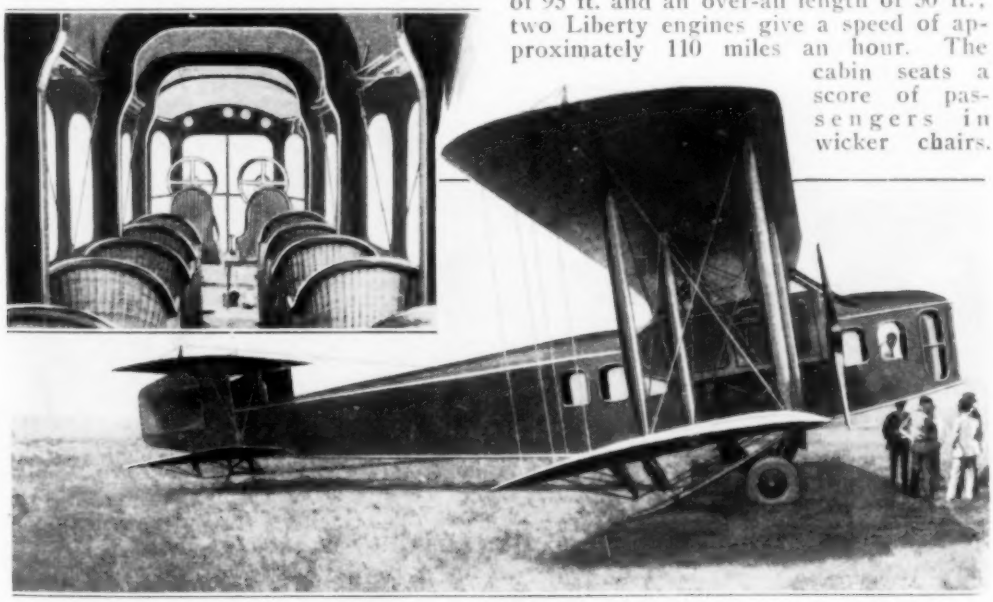
¶A number of five-ton concrete buoys have been constructed by the Public Works Department of Kingston, Jamaica. Each buoy is about 6 ft. in diameter, with cylindrical walls about 3 in. thick.

REVOLVING GLASS CYLINDER ON NOVEL DRINK MIXER

Drinks prepared in a new mechanical mixer come in contact only with glass, as the device is not equipped with a metal mixing rod, common in other types. This feature, according to the manufacturers, renders the contrivance more sanitary. Two glass jars fit together to form a liquid-tight cylindrical container, which is held by arms pressing on its ends and revolved by a small electric motor. The latter is controlled by an ordinary snap switch, which can be installed wherever convenient.

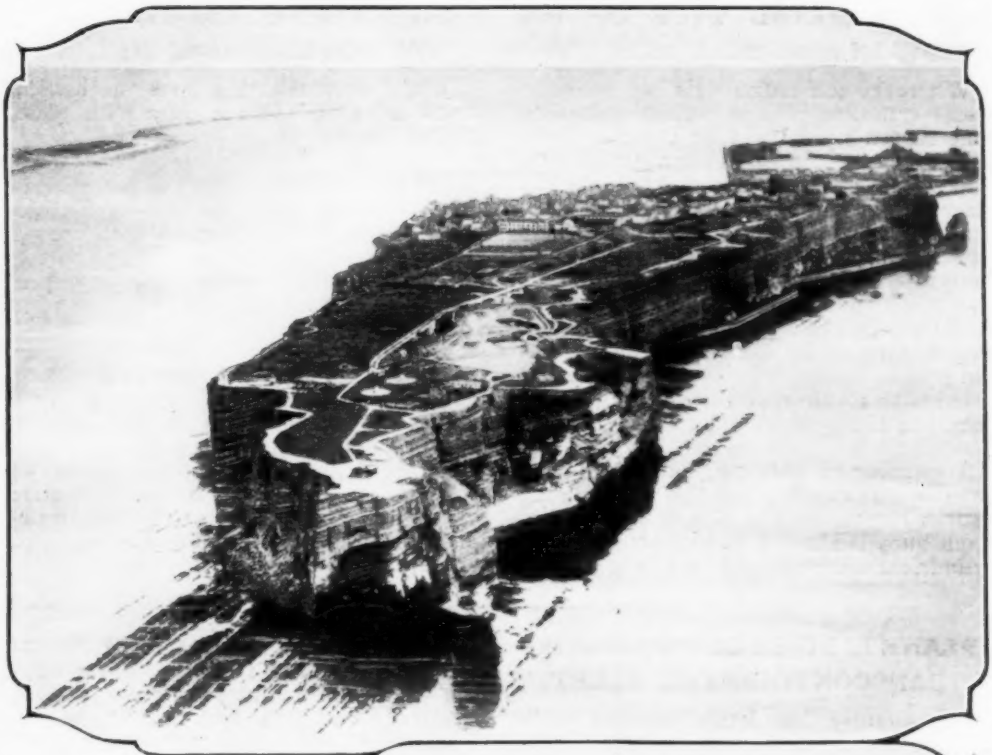
PLANE IS FIRST OF PROPOSED TRANSCONTINENTAL FLEET

The country has lately watched with interest the flight of a great passenger-carrying biplane from Milwaukee to New York and Washington, D. C., and return. The performance is excellent in itself, but is made spectacular by the report that the ship is but the first of a fleet that will maintain regular service between New York and San Francisco. "Parlor-car" planes in the daytime and "sleepers" at night may rush passengers from coast to coast in 36 hours. This first unit of the proposed fleet has a span of 95 ft. and an over-all length of 50 ft.; two Liberty engines give a speed of approximately 110 miles an hour. The cabin seats a score of passengers in wicker chairs.



The Lawson Air Liner: The Photograph at the Upper Left Shows the Interior of the Cabin, Looking Forward. Each of the 20 Passengers Sits beside a Window of Smoked Celluloid

HELGOLAND, GERMANY'S GREAT ISLAND FORTRESS



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Helgoland, Germany's Famous Island Fortress in the North Sea, has Emerged from Its Censorial Mystery Only to Disappear, for Its Defenses are Now being Destroyed to Carry Out the Terms of Peace. In This View, Looking South along the Island, the Harbor near the Northern Point Is Visible, and Two Heavy Armored Turret Guns, Showing as White Circles on the Ground

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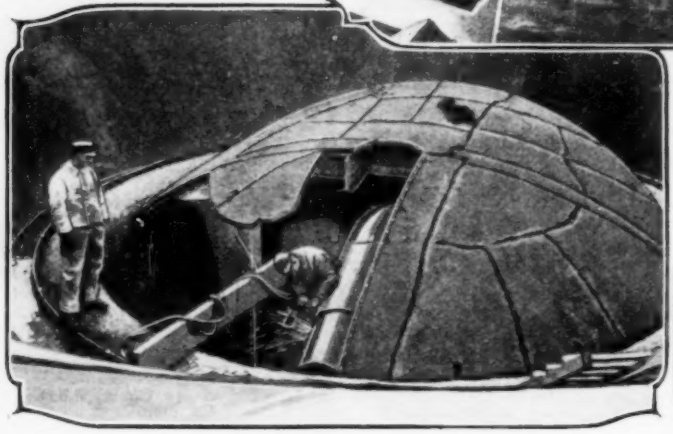
One of the Last Improvements Made by the Germans Was the Huge, Unfinished Concrete Breakwater Guarding the North Sea Side. During the War, This Massive Structure Formed One of Germany's Most Important Submarine Bases



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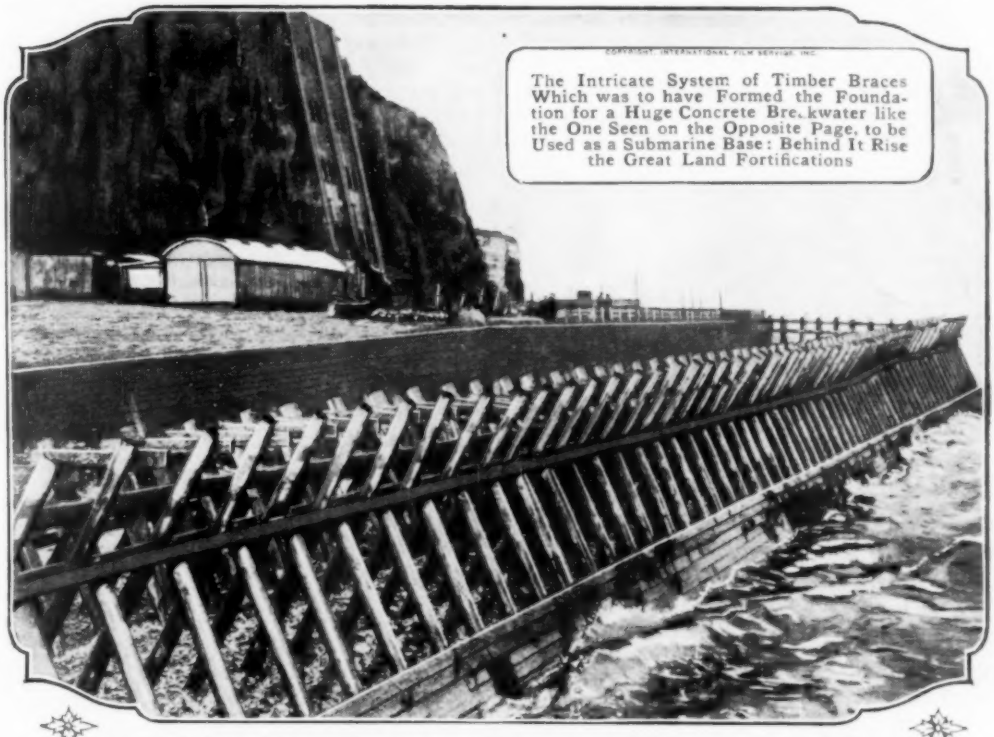
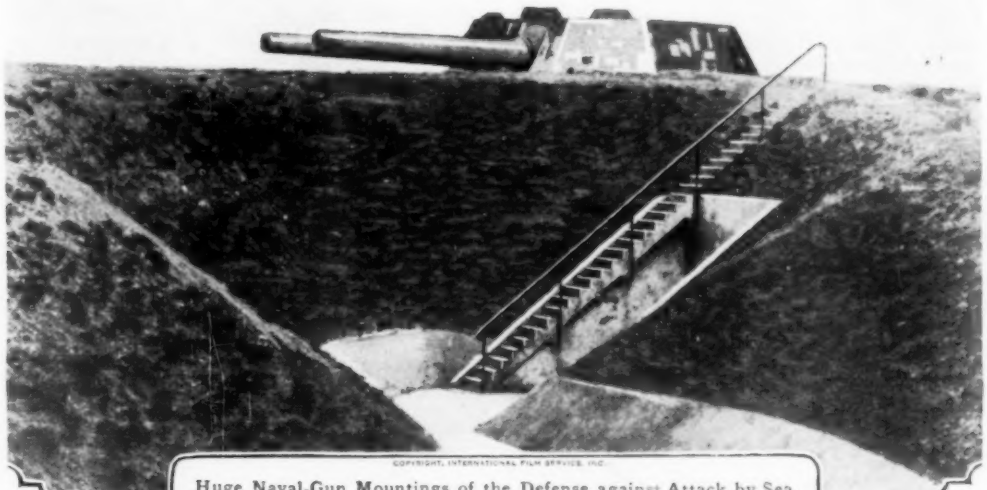
The Turtleback Cupola at the Left Is the Protective Armor of Steel Covering a Large Howitzer. The Workmen are Engaged in Cutting the Steel with an Oxyhydrogen Flame, Rapidly Converting the Armor Plate into Scrap Iron

DESTROYED TO SATISFY THE TERMS OF PEACE



The Intricate System of Timber Braces Which was to have Formed the Foundation for a Huge Concrete Breakwater like the One Seen on the Opposite Page, to be Used as a Submarine Base: Behind It Rise the Great Land Fortifications



Huge Naval-Gun Mountings of the Defense against Attack by Sea, Seen Only as White Dots in the Top Picture of the Preceding Page: Some of These Guns are Reported to Be 20-Inch Bore

ELECTRIC LIGHTS WORN BY TRAFFIC OFFICERS

Nighttime traffic congestion at several street intersections in Boston has made it necessary to protect the traffic officers by means of electric lights on hats and shoulders. Current for the three bulbs is supplied by dry batteries carried in the overcoat pockets. The traffic officer, who was in this case a sergeant in the state guard, is made still more conspicuous by long white gloves and white straps, placed crisscross on his breast.

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Electric Lights, White Gloves, and White Straps Guard This Traffic Officer by Making Him Conspicuous

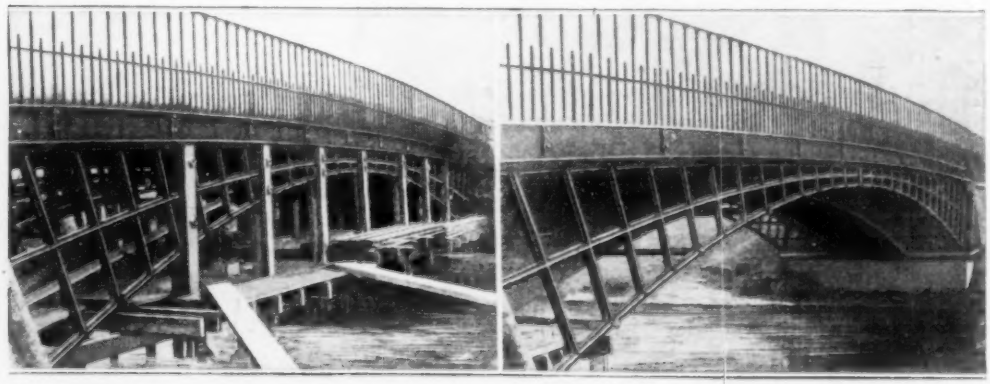
OLD IRON BRIDGE RESTORED BY CONCRETE ARCHES

With controls unmanageable, a tractor engine broke through the railing of a cast-iron bridge in Shropshire, England, several months ago, and in this way reminded the guardians of local engineering records, that the old structure had been in constant use for 95 years. During all that time it had required only routine repairs. The ensuing examination showed that, though it had long carried loads that far exceeded anticipations of its constructor, masonry and ironwork were in excellent condition. Of the four cast-iron ribs, or arches, however, the two inner ones were found to be slightly fractured in several places. Repairing with fishplates was first considered, but eventually rejected in favor of a scheme of strengthening the two central ribs by incasing them with ferro-concrete. Staging was accordingly suspended from the unaffected outer ribs, and work started simultaneously from both abutments. Reinforcing bars, links, and stirrups, were first assembled, after which the concrete was poured. Six weeks later the old bridge was opened once more, this time better able to bear the heavy traffic of today, though in appearance little changed.

FIRE TRUCKS COLLIDE IN BUSY STREET

Even a hotel lobby may be no haven of safety from traffic dangers when high-speed fire trucks collide. Two of the big motorized engines, weighing nine tons each, met head on in a Syracuse, N. Y., street a short time ago, and when they had stopped spinning, one rested on the sidewalk, headed for home, and the other occupied the lobby of a hotel. It had hurdled a line of ash cans at the curb, cut off a lamp-post, picked up two passers-by, and entered the hotel through a plate-glass window. Inside it caught another innocent bystander, and set him down unharmed at the desk; but the two men carried through the glass were severely injured.

¶Any passenger on a Handley Page London-Paris air liner may purchase for 72 cents a luncheon basket containing sandwiches, fruit, and chocolate.



Cast-Iron Bridge Built a Century Ago by Famous British Engineer: Small Fractures in the Two Inner Ribs, or Arches, Made It Necessary to Inclose Them in Ferro-Concrete, 18 Inches Thick. The Suspended Staging is Shown at the Left; the Rehabilitated Arches, at the Right

FRANCE TO STORE EXPLOSIVES IN GLACIER-FED LAKES

The glacier-fed lakes of the Pyrenees are to be the storehouses for France's vast accumulation of military explosives, according to a recent declaration in the chamber of deputies. The speaker explained that the stuff will deteriorate quickly if kept in the usual way, eventually becoming a menace to life and property. If destroyed outright, on the other hand, the government will suffer a loss of almost a billion francs. So instead of "keeping her powder dry," as enjoined by the old saw, it seems that France will keep it damp, and incidentally at a low and even temperature, in the strange storehouses mentioned. It is hoped that the life of the powder will be increased in this way from the usual 10 or 12 years to 50 or more.

MOUNTAINOUS PILES OF CORN SNOW-CLAD IN COLORADO

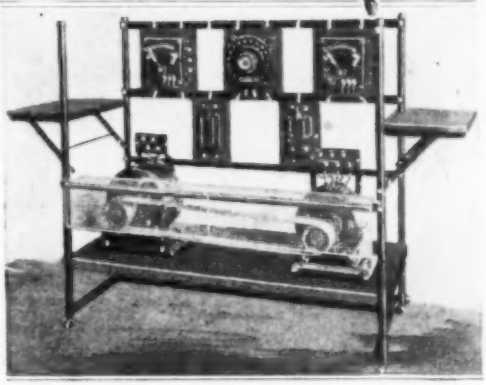
Thousands of bushels of corn, heaped in mountainous piles, lie on the fields of eastern Colorado, and now the first winter snows are drifting over them. The season's crop has been so tremendous that the facilities for moving it have been taxed beyond capacity, leaving a good deal of chilly work for the shuckers.

A 5,000-Bushel "Mountain" of Corn, Caught by the Snow Before It could be Moved, and Promising the Shuckers Cold Fingers

RACKS OF ELECTRICAL UNITS SIMPLIFY INSTRUCTION

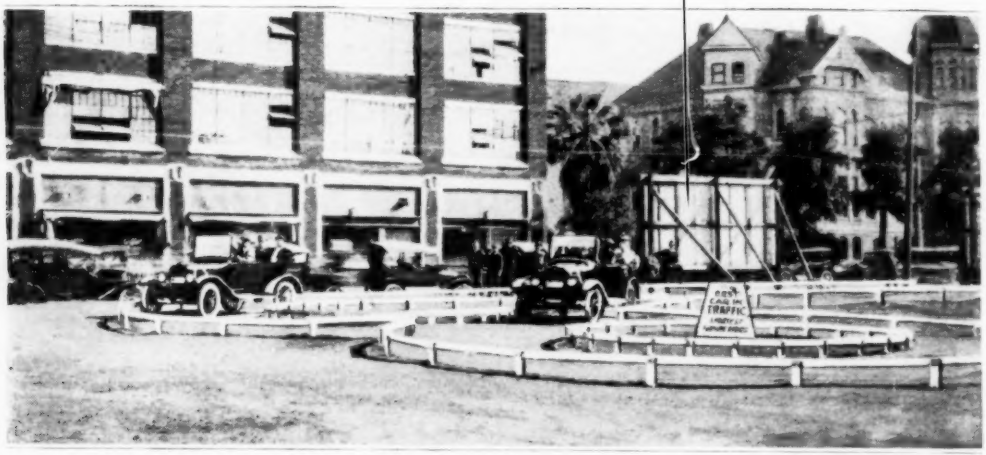
Instruction in electrical subjects is greatly simplified by an ingenious system recently brought out by a Wisconsin firm, of mounting collections of related units on panels and displaying the panels on special portable racks. The lighter apparatus, such as signaling and telephone equipment, is arranged on standard panels, of which several may be stored in the lower part of the rack. Motors and generators have a frame of their own, protected by a wire guard. The racks are on casters and may readily be moved from one classroom to another, increasing the convenience and reducing the expense of instruction by stationary installations.

Left, Above, Single Panel of Signaling Equipment; Right, Portable Rack for a Number of Panels



Special Rack for Motors and Generators, with Wire Guard for Protection and Casters for Portability

¶ The "Lost and Found" column of an eastern newspaper recently carried for the first time a notice headed "Lost from an Airplane." An aviatrix advertised in this way the loss of a fur neckpiece during an exhibition flight.



This Section of the Quarter-Mile Demonstration Track, Constructed by an Enterprising Automobile Merchant, is Devoted to Several Sharp Turns That Prove the Value of the Car on Narrow City Streets. Prospective Purchasers Who have been Carried over the Odd "Steeplechase" in the Dealer's Demonstration Car Know Exactly What tne Machine can Do

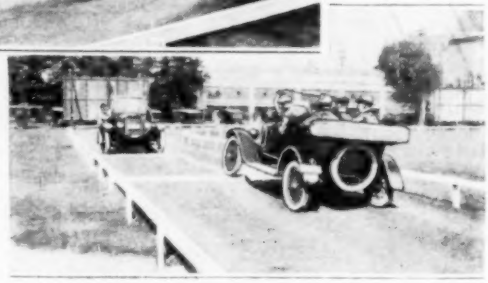
TRACK TESTS CARS UNDER ROAD CONDITIONS

On This Rock-Strewn Stretch is Demonstrated the Mettle of the Springs

The Four Rails in the Above Picture, Simulate the Ordinary Country Railroad Crossing

Above Is a Series of "Thank You, Ma'am's" That Rivals the Worst Found on Any Road

The Mounds at the Right Play the Role of Culverts, Subjecting the Cars to a Twisting Strain

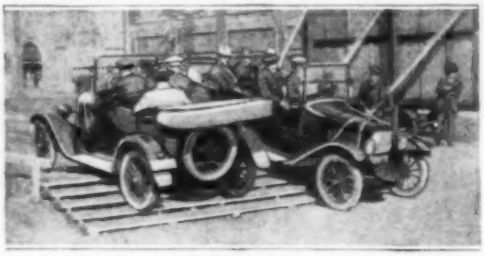


Realizing that the demonstration of automobiles on paved streets is hardly fair to the prospective buyer, and that it has numerous evils from the standpoint of the automobile seller, an automobile company has built in Los Angeles a ¼-mile demonstration track, which is used to show their cars to prospective customers under road conditions identical with those that would be encountered on a transcontinental tour.

The auto track occupies a number of vacant lots near the sales agency. Here the demonstration track winds about the field, going over a stretch of bowlders, up and down two stairways, over railroad tracks, bumps, and pot holes, that simulate the conditions encountered in the ordinary cross-country motor touring. In addition to demonstrating the riding qualities of the car under such conditions, the track is also provided with several sharp curves, and a figure "8" designed to show the machine's easy handling as applied when driving in congested city traffic.

The test track has commanded much public interest, and since its opening, the two demonstration cars being used for this work have carried

approximately 1,000 persons over the course each day. In addition to showing the performance of the car under actual country-road conditions, the test track also gets the automobile dealer away from numerous perplexing problems, such as salesmen joy riding in the machines, persons "mooching" free taxicab service under pretext of interest in purchasing, etc. Another big item in favor of the test track is that it reduces the expense of demonstrations, by the elimination of waste mileage in seeking those road conditions that many prospective buyers demand to see the car driven over, and the great saving of time among employes in giving demonstrations that really mean something to the prospective buyer. The experiment is thus a success from every viewpoint.



For Good Measure, the Dealer has Added These Steps to the Obstacles on His Demonstration Track, Putting His Cars to a Test Never Encountered in Actual Use

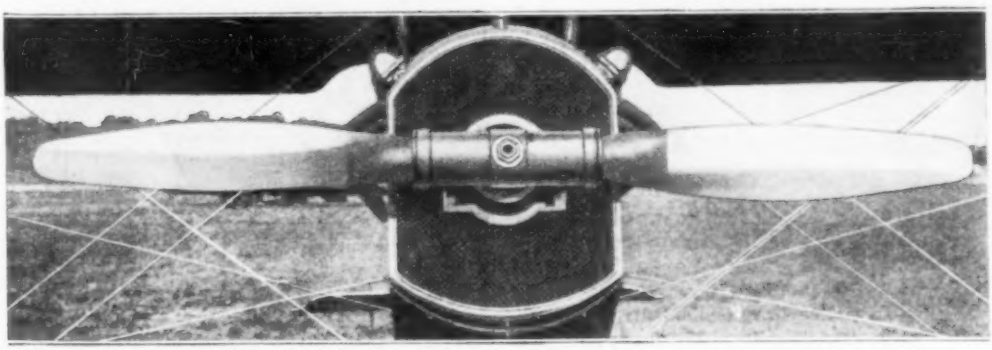
REVERSIBLE PROPELLER NOW UNDER GOVERNMENT TEST

To the future may best be left all appraisal of the reversible airplane propeller. Perhaps it will some day be judged the greatest contribution to the art of mechanical flight since the Wrights' first biplane; perhaps not. Sufficient now is the bald statement that the mechanism illustrated and described in Popular Mechanics Magazine for December, 1917, is being tested and developed, under government supervision at McCook Field, at Dayton, Ohio. It is mounted on a standard training plane.

Examination of the device shows that its virtue lies in its simplicity. The inventors have realized that the gears and other complexities of previous attempts spelled weakness and failure from the very start. They believe that only the simplest of mechanisms can withstand the tremendous centrifugal stresses developed with peripheral speeds that sometimes run to 600 miles an hour.

MANY PLANETS LINE WITH SUN IN UNUSUAL CONJUNCTION

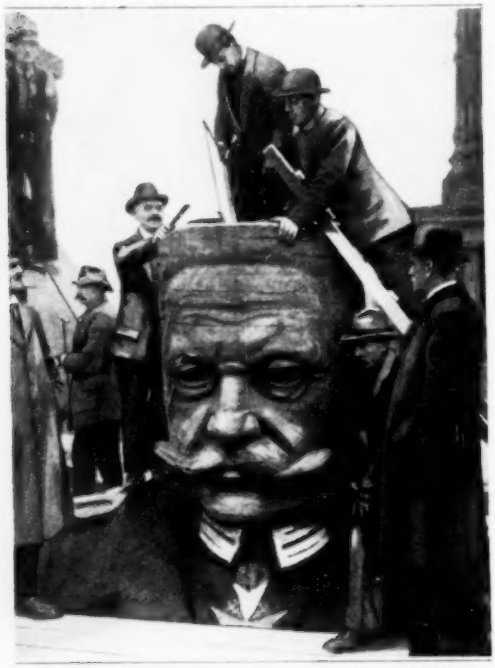
The mechanism of the solar system is set for strange action on December 17, 1919. On that date the great planet Jupiter, red Mars, Venus, Saturn, little Mercury, and the remote Neptune all will range themselves in line between the sun and earth, while Uranus will continue the vast series on the opposite side of the sun. Many old-time superstitions have been revived by this unusual conjunction, and alarmists have even appealed to modern science to support the theory that the combination threatens to produce a huge sun spot and cause electromagnetic disturbance on the earth. Astronomers point out, however, that there is no connection between planetary attraction and sun spots, and that earth dwellers will remain physically unaware of the celestial combination. Four of the planets will be visible just before dawn at the time of the conjunction.



Details of the Construction and Operation of the Reversible Airplane Propeller are Withheld at the Request of the Air Service Authorities. It Is Possible to Say Simply That the Mechanism is being Developed with Satisfactory and Encouraging Results

WOODEN HEAD OF HINDENBURG DETRUNCATED IN BERLIN

If the German field marshal, von Hindenburg, has not yet suffered official de-



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The Trunkless Head of the Great Hindenburg, Done in Wood, Lying in a Berlin Park After the People had Dismantled the Heroic Statue

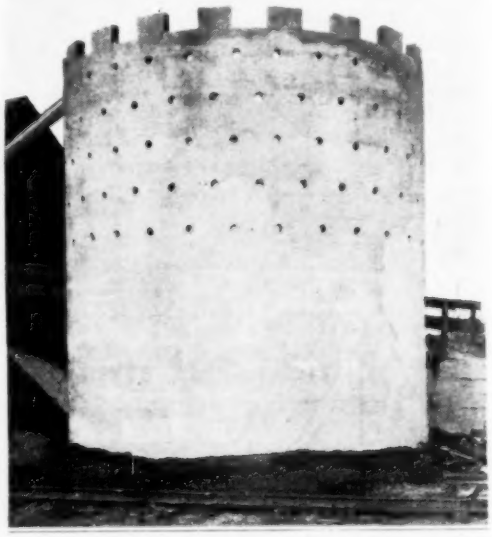
capitation, at least that humiliation has been visited upon his gigantic effigy in the Berlin Zoölogical Gardens. This great statue, made of wood because all metal was needed for war purposes, was erected as an inspiration for popular subscription to the war loans, and for each subscription a nail was driven into its base. Now the people have wrecked the huge figure, and its colossal head is lying in front of the prematurely named "Column of Victory."

WEAKNESSES OF OLD BRIDGES REMEDIED BY NEW STUDY

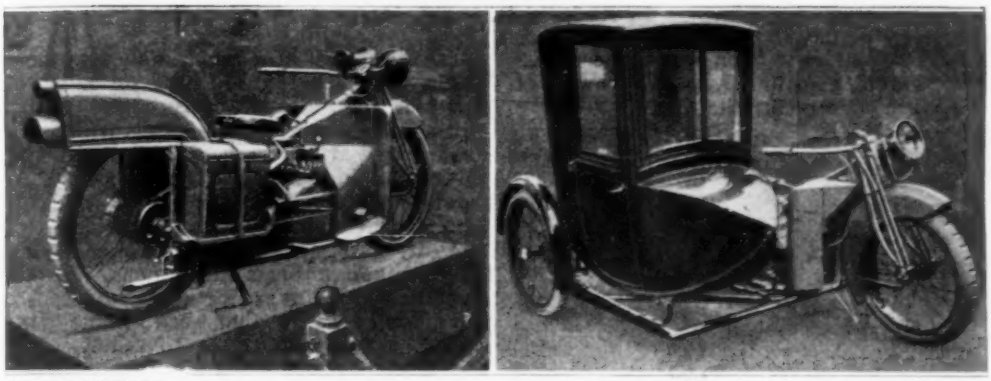
Restoring strength and resiliency to old steel bridges is a comparatively new branch of engineering effort. The usefulness of the work is dependent on the ability of the engineer to diagnose the ailments of a bridge, and their cause. While a railroad bridge does not wear out like moving machinery, its parts are by no means stationary, but are set into rapid vibration by every impact and every shift of the load they carry. Bridges built 25 years ago to carry 125-ton engines and 45-ton cars, now must carry 250-ton engines and long trains of cars up to 150 tons, and at greatly increased speeds. The original effects of impact by flat wheels and at rail joints, and the vibrations of unbalance and side sway, are therefore multiplied several times, and their cumulative result is to weaken the structure. Rust and corrosion, too, have their debilitating influence. To analyze these conditions, and, by applying the correct remedy, to save the expense and trouble of installing a new bridge, is the function of the engineer.

CONTRACTOR BUILDS FURNACE WITH CONCRETE SILO FORMS

The contractor who constructed a large corn elevator for a western farmers' association was primarily a builder of concrete silos. So, when it became necessary to make an outdoor furnace for the destruction of the cobs, which accumulate so rapidly, he simply used his silo-building forms and other equipment. The completed furnace consequently resembles a truncated silo, with numerous smoke holes piercing the upper half. Within, it is lined, up to the level of the lower holes, with heavy fire brick.



This Is Not an Ancient Castellated Dungeon Keep, but a Concrete Cob Burner Built by a Silo Contractor. The Walls are Lined with Fire Brick



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At the Left is Shown a New French Motorcycle of Original Design, Recently Exhibited at the Paris Automobile Show, and at the Right, the Same Cycle Attached to a Luxuriously Appointed Sidecar Specially Built for It

MOTORCYCLE CARRIES SIDECAR BUILT LIKE LIMOUSINE

At the recent automobile show in Paris, first of its kind since 1913, there was exhibited a sidecar "coupé" that drew much favorable comment. Its pleasing lines, glass doors, and windshield, and the heavily upholstered interior combine to make it quite as desirable for many purposes as a high-priced automobile. The odd sidecar is built for use with a heavy French motorcycle of equally radical design, and intended for touring and commercial purposes.

TRANSOCEAN-RADIO DETAILS SHOW PLAN IS PRACTICAL

The object in transmitting wireless telephone messages across the Atlantic from Canada to Ireland some months ago, as announced in Popular Mechanics Magazine last June, was to gauge the amount of current necessary for practical work. It is now disclosed that a 3½-hp. alternating-current generator was used with a wave length of 12,000 ft., the aerial being 500 ft. high, and the current sent into it 16 amperes. With the ordinary commercial type of amplifying equipment at the receiving end, the messages sent under the most difficult conditions were clear and easily received.

¶A Pittsburgh laboratory has taken up the work of collecting and purifying radium emanation, for use as a substitute for the element itself in hospital work, because of the risk of losing small tubes of radium. The emanation is purified by a chemical process.

MILLION-POUND LIFT BRIDGE THREE HUNDRED FEET LONG

For two years steel workers and bridge builders have been engaged upon the construction of a remarkable single-leaf bascule bridge across the Chicago River, in a railroad-yard district of the city. The new structure, now completed, is stated to be the largest of its kind in the world. The length of the bascule is 300 ft., and it is balanced by a counterweight of nearly 1,000,000 lb. It is essentially a railroad bridge, and carries a double track. The counterpoise weights of the bascule are built up of huge blocks of concrete.

Bascule Bridge with a Single Leaf, 300 Feet Long, Asserted to Be the Largest of That Variety in the World: The Counterweights Required to Balance It are Made of Concrete, and Weigh Nearly 1,000,000 Pounds

THUNDERSTORMS IN THE MAKING

By ROGERS D. RUSK, M. A.

HAVE you ever been up in the air to watch a thunderstorm grow? If you were merely on the ground looking up, then you saw only the bottom of it. The airman is the one who sees just what is happening in a thunderstorm, and the accompanying pictures illustrate the birth and growth of a regular summer joy killer.

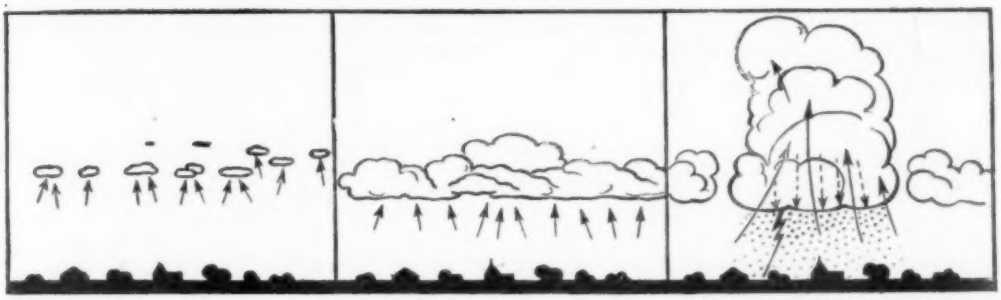
This Photograph was Taken from an Airplane to Show the First Development of a Thunderstorm. The Cloudlets Indicate Where Moisture, Rising from the Earth, has Begun to Condense

While the rain is dashing on the earth beneath, strange things are happening high up in the air. Dark masses of vapor push up above the storm and tower miles into the sky. Whirling currents of air cause the clouds fairly to boil up and down, while the lightning flashes and the thunder is deafening. All this has grown from a very small beginning. A few hours before the sky was, perhaps, perfectly clear. All at once a few white patches become visible to the eye, and if they quickly begin to dot the whole sky, it is a warning sign.

The picture illustrating this point, taken at an altitude of 4,000 ft., shows in a remarkable way how these clouds begin to form on a warm summer day. Each fluffy cloud represents the point where moisture rising from the earth has begun to condense. The rapid formation of the clouds means uneven heating of the surface of the earth and the presence of lots of moisture in the air. These are the conditions which cause thunderstorms in summer. If this condition continues for an hour or so, the result will be that seen in the next photo. The clouds grow together, forming a continuous rolling mass of dense vapor, cutting off the flier's view of the earth. To the people below, the sky grows dark, and they say it looks threatening. Up above the clouds, the turbulent vapor disturbs the air and the flier experiences "bumps."

So far the storm has only been threatening. The clouds have spread sideways as far as they can; now they begin to grow heavier. The heated air from the earth below pushes through the heavy layer and bulges it upward. Higher and higher it is pushed while more and more moisture condenses, and this great bulging mass of vapor, sometimes three or four miles high, has become a thundercloud. Its bulging tops are called thunder peaks or thunder heads, and they are responsible for the lightning, the heaviness of rainfall, and the hail we sometimes have in midsummer. One of these stupendous thunder heads, its top four miles above the earth, is shown in the last picture on the opposite page.

The Little Clouds in the First Photograph have Coalesced, after an Hour or Two, into This Rolling Mass of Vapor Which Shuts the Earth Away from the Airmen



Here, in Diagram Form, Is the Story of the Thunderstorm. The Little Clouds at the Left Are the First Condensation of the Rising Moisture, Indicated by the Arrows. Later, These Cloudlets Unite, as in the Center, into a Tumbling, Yet Rather Level, Mass of Vapor. At Length, Warm Air from the Earth Pushes This Vapor into the Massive, Fantastic Thunder Peak Pictured at the Right. A Thunderstorm Follows

The energy of a thunderstorm is amazing. A single great cloud may contain billions of pounds of water vapor. The energy developed in a few hours may be more than was taken to build the pyramids. The flashes of lightning from cloud to cloud are sometimes 20 miles in length, and when we stop to think that it takes a current of 15,000 volts' pressure to produce a spark an inch long, we can only wonder at the immense amount of electricity involved in a single flash. Sometimes the wind from a thundercloud, or the "squall" as it is called, is violent enough to level trees and small buildings, and is improperly called a tornado. There is a big difference. A tornado is a violent whirlpool of air that sweeps across the country and twists off trees and roofs in its path. The wind from a thunderstorm blows straight away from the storm and never twists. The tornado is always dangerous, while the wind from a thunderstorm is only occasionally dangerous.

When the energy of a thundercloud is so enormous, it is no wonder that violent winds and immense charges of electricity are developed. The diagram shows how this happens. In the first place, the higher the thunder head grows, the more moisture condenses, and the more rain falls; also the colder the upper portions of the cloud become. In a hard storm, where the thunder head pushes to an extreme altitude, the temperature becomes so low that the drops of water freeze and form hail. The air is always electrified with respect to the earth, and the condensing vapor collects these charges. There are also two main currents of air in such a cloud, the warm air pushing upward and the cold air and the heaviest drops of water falling downward. This causes a separation of the charges of electricity (most small drops are negatively charged) which continues until the lightning flashes from the top of the cloud to the bottom, or from one cloud to another, or from the cloud to the earth. Flashes to the earth are seldom more than a mile long, as the bases of thunderclouds are rarely more than that distance above the earth, and usually are much nearer.

Broadly speaking, there are three general stages in the development of a thunderstorm, corresponding to the pictures given and to the diagram. There must be strong currents of moist air rising from the earth, as indicated by the appearance of the white patches of cloud. This condition must continue until the sky is covered. And lastly, the force of these upward currents must be great enough to push the clouds up into thunder heads. A thunderstorm then results.

The Thunder Peak has Formed. Back of the Airplane is Seen the Towering Mass of Vapor, Molded by Rising Air Currents from the Earth

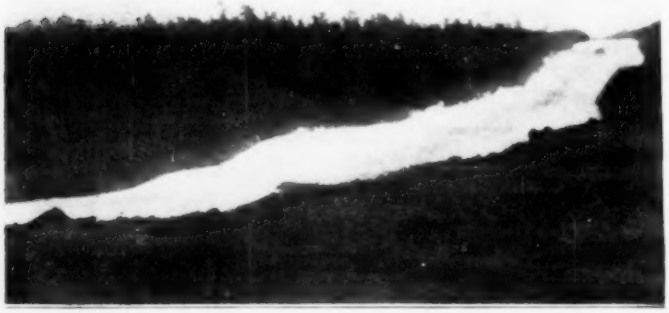
Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

MAUNA LOA'S RIVER OF FIRE ILLUMINATES WHOLE REGION

With a veritable river of fire flowing for 20 miles through a mile-wide valley

Mauna Loa's Immense Fountain of Illuminated Vapor, Viewed from a Distance of Five Miles, and at an Elevation of 3,000 Feet

it has burned for itself, and gigantic fountains of steam spectrally illuminated by subterranean flames, the island of Hawaii has become a place of titanic and awful spectacle. The eruption which burst forth so violently a few weeks ago from Mauna Loa's lofty summit, rising more than 2½ miles in air, was described in this magazine last month. Since then the stream of white-hot lava has narrowed, but deepened in proportion, with no diminution of incandescence. In the intense radiation of light from this torrent of the inferno, it is possible to read at midnight five miles from its course, and remarkable photographs have been taken of the luciferous flood by its own radiance.



A River of White-Hot Lava, Flowing for 20 Miles from Mauna Loa's Summit to the Sea, through a Burned Valley a Mile Wide: One may Read at Midnight, Five Miles Away, by the Light It Radiates, and the Two Photographs Here Reproduced were Taken with No Other Illumination

TO WORK GREAT COAL FIELDS FOUND IN EAST AFRICA

Coal deposits of great extent and good quality have been found in Portuguese East Africa. British financiers already have acquired exclusive mining rights until 1940, and perpetual rights to all registered mines, in a tract of more than 25,000 square miles along the Zambesi River. Workings will be started at once.

GRAPE SEEDS YIELD GOOD OIL FOR COOKING AND SALADS

Grape seeds, now discarded as the most valueless of waste matter, have been found to yield, when pressed, an oil that may serve as a substitute for cottonseed or even olive oil, for cooking, and as a satisfying ingredient for salad dressings. In the U. S. Department of Agriculture laboratories, a practical method has been found for extracting the seeds from the wet residue after expressing the juice of the grapes, and a plant for that purpose might well form part of the grape-grower's equipment. This work would have to be done in the pressing season, from September to November. The extraction of oil from the dried seeds could then be extended through the winter months. A valuable by-product so easily obtained, and for which the raw material exists in great quantities, should do much to revive the waning interest of the grape growers.

Steel Floor of the Biggest Gas Holder, 219 Feet in Diameter, as It Appeared Just After It had been Laid in Place by About 150 Men: The Operation Took Only an Hour and a Quarter

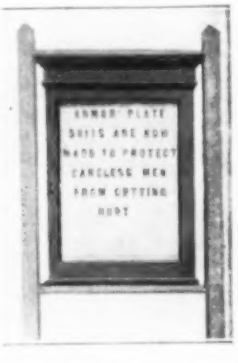
BUILDING THE BIGGEST STEEL GAS HOLDER

The immense steel bottom for one of the four largest steel-tank gas holders in the world was recently lowered into place at Baltimore, without bending or accident of any kind, in the remarkably short time of 75 minutes. Well-synchronized work on the part of about 150 men accomplished this feat. The holder, which, of course, is absolutely gas-tight, will have a capacity of about 10,000,000 cu. ft. of gas when completed. It will be 219 ft. in diameter, and will cover an area of 38,000 sq. ft. In height it will be 36 ft. 6 in. when not inflated; but when it is inflated it will rise to six times that height. The water compartment at the bottom will hold 10,190,000 gal. of water.

To make this giant gas holder, 7,720 steel plates will be used, with the necessary angles, channels, and beams; and 1,090,000 rivets will be required to connect the plates. It is estimated that it will take about five months of work to complete the big holder. It will have six lifts, each of which telescopes into the one below it as the gas is exhausted. Gas holders are filled with gas as it is made, and rise just as a balloon rises. Once in a great while the top lift of a gas holder balloons off from the structure, but modern construction has practically eliminated this danger. Weights are placed on the top when completed, which make it possible to force the gas into the distribution system, often for considerable distances, just by the sheer pressure of the crown. Another holder of about equal capacity is in the course of erection near Chicago, and there are two others in existence somewhat larger than either of these two.

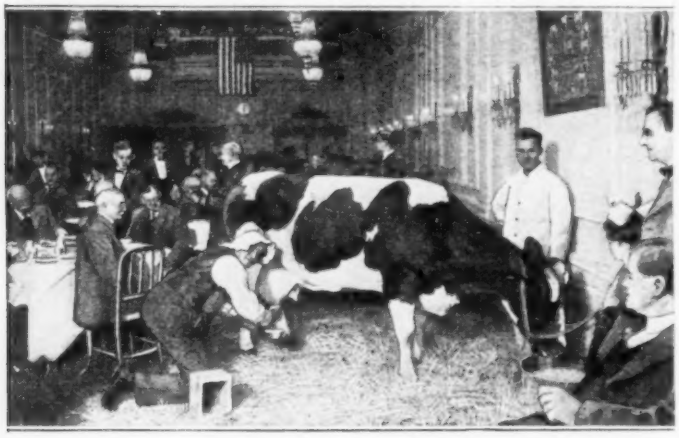
FACTORY WORKERS CAUTIONED BY NOVEL WARNING SIGNS

Subtly humorous signs are employed at a certain middle-western factory to impress upon the minds of employes the necessity of using care in their work. One recently displayed announced that suits of armor are made to protect careless workmen. The clever hint is declared to have produced satisfactory results. Interchangeable letters make it possible to vary the wording of the signs at frequent intervals. The signboard is near the factory entrance.



PRIZE COW IS HONORED GUEST IN HOTEL DINING ROOM

A comely black-and-white cow was an invited and well-behaved guest at a business men's luncheon in the "crystal room" of a Portland, Ore., hotel the other day. The purpose of the occasion was to honor the bovine, known as "Tilly Alcartra," for extraordinary industry and productiveness. She is seven years old, and in six years has produced 156,776.1 lb. of milk, yielding 6,146.36 lb. of butter—an average of 26,129.3 lb. of milk and 1,023.56 lb. of butter a year. For this reason she is valued at a hundred thousand dollars.



"Tilly Alcartra," Prize Milk and Butter-Producing Cow, Honored Luncheon Guest of a Business Men's Meeting in a Western Hotel Dining Room and as Well-Behaved as Any of Them

FLYWHEEL HURLS FRAGMENTS THROUGH BRICK WALL

In these days of sensitive governors, the bursting-flywheel accidents of old are quite infrequent. That centrifugal force still awaits its chance, however, was demonstrated the other day in an Illinois coal mine, when the big engine "ran away." The great flywheel burst into fragments, some of them of 200-lb. weight soaring 500 ft. through the air and crashing through an 18-in. brick wall. By the time the engine stopped from lack of steam, it was clear off its foundation, and had wrought $5,000 worth of damage.

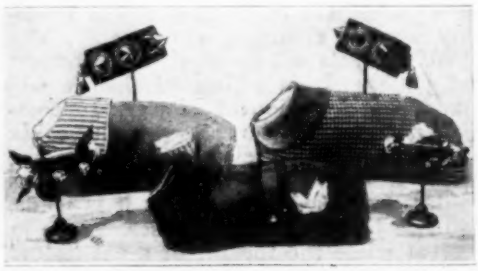
¶A microphone suspended from a boat, with a telephone receiver at the boatman's ear, is a method now successfully used by Norwegian market fishermen for detecting and locating schools of fish.

EXPERIMENTERS STUDY ACTION AND COMPOSITION OF MUD JET

Although the mud jet has been employed to extinguish fires about coal mines for many years, it is only recently that scientific investigation has showed the reason for its efficiency and the manner of its proper use. The mud jet extinguishes fire, not so much with its water content as by its power to cement loose particles together, forming a cake over the burning areas, and so smothering the flames. Working on this assumption, experimenters have found that the best mud consists of sifted earth, screened through .2-in. mesh, boiler ash, dust from blast-furnace gas, and even combustible material like the solids from coal washings. The resulting mud can be successfully forced through pipes by gravity, steam, or air pressure.

TAILORED OVERCOATS MADE FOR FRENCH DOGS

Carefully tailored overcoats with roll collars and patch pockets are this winter robbing cold weather of its terrors for the house dogs of Paris. Fancy weaves, including stripes and checks, lend to the coats a distinction that is emphasized by the handkerchief carried jauntily in the hip pocket. The canine wardrobe is completed by a heavy leather collar which is studded with brass and adorned with a tinkling bell.



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The Canine Beau Brummels of Paris are This Winter Ornamenting the Boulevards in These Tailored Overcoats. Each Costume is Completed by a Leather Collar with Tinkling Bells

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

SPORTSMAN SHOWS CANOE IN EXPERT HANDS IS VERSATILE CRAFT

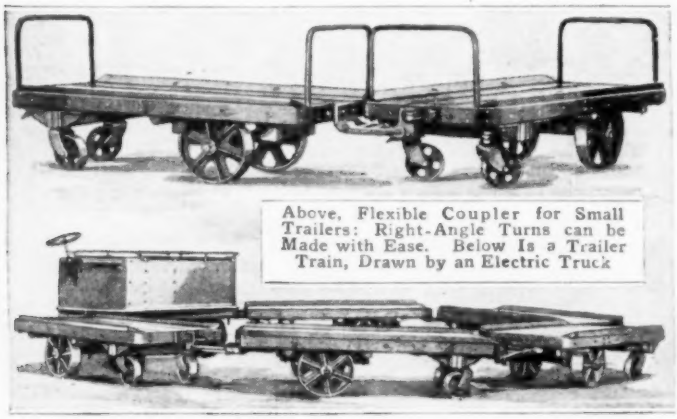
Long Practice with the Paddle has Given a Sportsman from New York City Complete Mastery of the Canoe. Three of His Feats are Shown on This Page. He Demonstrates Above That a Water-Filled Canoe will Not Only Support the Weight of Two Persons, but can be Paddled to Shore in Its Submerged Condition. At the Left, He has Driven His Craft, with Bow Raised, upon the Deck of the Other

The Central Photograph Shows the Same Performance from a Different Angle. To Complete the "Stunt," the Sportsman Crawls to the Bow of His Canoe, Forcing His Craft into the Water Again, and Thus Accomplishing a "Jump" over the Other. The Lowest Picture Shows His Variation of Hawaiian Surf-Riding. Maintaining His Canoe at Exactly the Right Point in the Wake of a Ferryboat, He is Pulled Along at 12 Miles an Hour without a Propulsive Effort of His Own

PHOTOS COPYRIGHT, KEYSTONE VIEW CO.

COUPLING DEVICE FOR TRAINS OF SMALL TRAILERS

Hand trucks are rapidly disappearing from modern docks, warehouses, and factories, and are being supplanted by trains of small trailers, drawn by electric tractors. The increased use of this new means of transportation has resulted in the development of an ingenious flexible-coupling device, which permits the trains to be turned in small space, allows their use on any grade, and renders easy the assembly or separation of their units. One member of the contrivance consists of a drawbar, mounted to swing freely on a horizontal axle. Another is a jaw, designed to receive the free end of the drawbar, and mounted to turn on a vertical axle. The jaw is equipped with an automatic locking device which is operated when the drawbar is inserted. A lever is provided for releasing the lock.



Above, Flexible Coupler for Small Trailers: Right-Angle Turns can be Made with Ease. Below Is a Trailer Train, Drawn by an Electric Truck

NEW SCREEN FOR RADIOSCOPY USES PLATINUM SUBSTITUTE

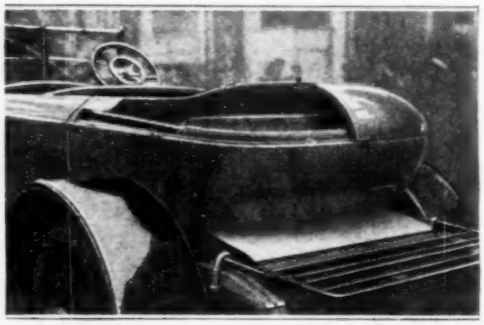
The high price of platinum gives value to the recent discovery by two French scientists that a cheap compound of tungsten and cadmium makes an excellent substitute for platinum on the fluorescent screens used in radioscopy. A coating containing the new ingredient is unaffected by the atmosphere, and is insensible to the prolonged action of the X-rays. It is found, too, that the resulting fluorescence is white, instead of green, as with the platinum compound. The black image of the object to be inspected or photographed is consequently outlined on the new screen with distinctness emphasized by greater contrast.

DIM CLOUDS FORMED IN SKY BY PASSAGE OF AIRPLANE

In connection with the suggested formation of artificial clouds by the exhaust from military airships, it is reported that recent experiments have led to discoveries along another line. It is claimed that the passage of an airplane through the air may result in the formation about the machine of a natural cloud. Such a phenomenon would not, of course, be absolutely impossible, as local changes of pressure in a very humid atmosphere might easily result in the condensation of water vapor and the formation of a "cloud." Analogous results have actually been obtained on damp days in high-speed wind tunnels, the vapor making visible the flight vortices about the suspended wing model.

AUTOMOBILE TOP DISAPPEARS INTO DOUBLE-WALLED BODY

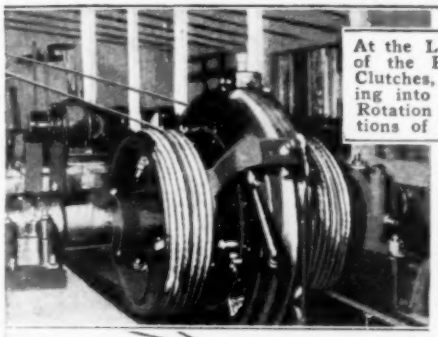
A novelty of the last French automobile salon was a car with a disappearing top. The car body is built with double walls, and the top, of Victoria style, drops down between the walls when folded. Removable cover sections conceal the opening, conforming to the general lines of the car.



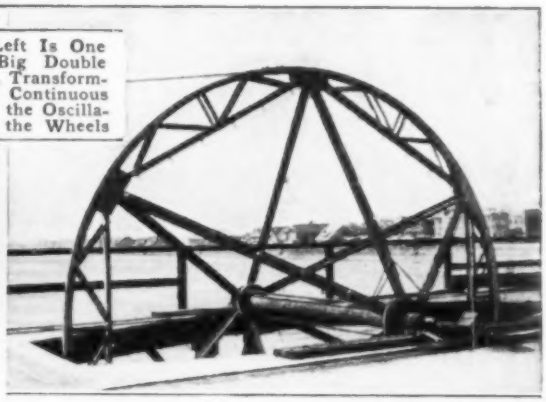
French Car with Hollow Walls, into Which the Victoria Top is Folded and Covered with Removable Sections

¶A powerful British wireless station is soon to forward, three times a day, meteorological reports of special interest to airmen.

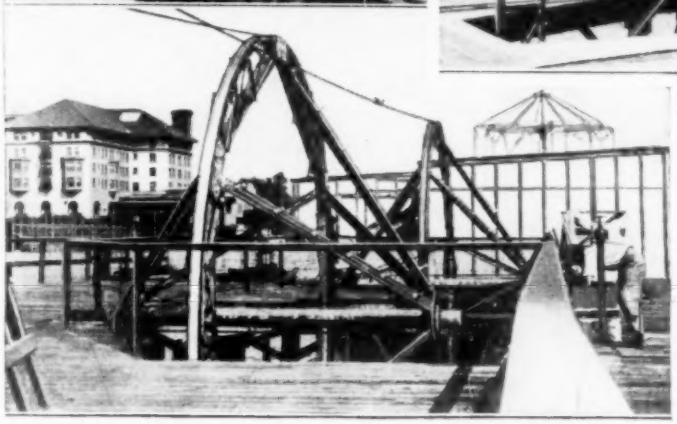
WAVE MOTOR HAS INGENIOUS CLUTCH SYSTEM



At the Left Is One of the Big Double Clutches, Transforming into Continuous Rotation the Oscillations of the Wheels



One of the 24-Foot Bull Wheels Appears Above. The Huge Paddle, Fastened to It by I-Beams, Hangs Below to Catch the Motion of the Sea



The View Shows Only a Part of the Wave-Motor Installation, Which Occupies Over 10,000 Square Feet of Pier Space. The Wheels Carry Electric Lights to Add Interest to the Operation

Wave motors, designed to utilize the waste power of the sea, are usually looked upon merely as a possible future development, and it is not generally known that a successful machine of this kind is in actual operation at Long Beach, Calif. The plant occupies a space 260 by 40 ft. at the end of a pier. Each unit consists of a paddle, 14 by 8 ft., attached by heavy I-beams to a bull wheel, 24 ft. in diameter. There are six of these units in operation. Ropes from each wheel pass to a system of clutches of peculiar form, so arranged that movement in one direction drives the main shaft, while reversal instantly releases the clutch. By using dual clutches, paddle movements in both directions are made to turn the shaft and operate an electric generator continuously.

DRINKING FOUNTAIN SUPPLIED WITH WATER FROM WELL

Electricity operates a novel water system that supplies well water to a public drinking fountain in Beaver Falls, Pa. An electrically driven pump draws water from a 106-ft. well, located under a fire station, and discharges it into a 500-gal. tank in the basement of the building. In addition to this, the device pumps air into the tank, creating pressure to force the water through a pipe to the fountain, which is placed on the sidewalk outside the station. When the pressure falls to a certain point, the machine is started automatically, and runs until the operating pressure has been restored.

The Water Which Flows from This Drinking Fountain is Pumped by Electricity from a Well Located under the Fire Station in the Background

SPRINKLER DESIGNED FOR USE ON EXTENSIVE GROUNDS

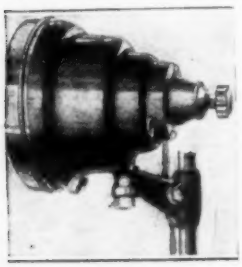
Water is evenly distributed over a large area by a new lawn sprinkler designed for public parks and large private

New Type of Lawn Sprinkler: Jets of Water Issue from Perforations, Arranged in Spiral Lines on the Long Pipe. The Device is Intended for Use on Large Grass-Covered Areas, and can be Moved Easily

grounds. The device consists of a 10-ft. pipe, mounted at one end on a two-wheeled truck, and provided at the opposite end with a two-legged rest. Arranged in spiral lines at 2-ft. intervals along the pipe are groups of perforations, through which jets of water are ejected when the sprinkler is attached to a hydrant. The contrivance is especially suitable for use on sloping ground.

AUTO HEAD AND TAIL LIGHTS COMBINED IN NEW ACCESSORY

Decided convenience for the motorist is embodied in this new windshield spotlight that functions, when required, as both headlight and tail light. The unusual feature is secured by piercing the reflector, and fitting into the opening a small red lens. The single bulb thus sheds its light both to the front and to the rear, making the new accessory especially desirable for use when the car must be parked on the city streets after sundown and for long periods of time.



RED CROSS TALE FROM SYRIA READS LIKE ROMANCE

Among the pleasantries practiced by the Turkish soldiery on the Armenians of Aleppo, Syria, was the appropriation for firewood of all planks and beams from their homes. The houses consequently fell apart, and the Armenians lived in the open. Discovering this condition on entering Aleppo, several months ago, the American Red Cross put a captain in charge of a building campaign. The captain at once dispatched cutters to the Taurus Mountains in the north. These floated the logs down the Euphrates in rafts to a spot about 50 miles across the desert from Aleppo. From this point they were carried by a camel caravan to their destination. Attacks by Bedouin tribes interrupted the service at first, but were soon discontinued when 30 armed men were sent with every convoy. The building campaign was a success, while the captain's American energy and pluck have won him a reputation that will certainly live in local legend.

AVIATION NOW TAUGHT IN COLLEGE

For the first time in the history of pedagogy, it is said, flying is now included in a college curriculum. A score of students in an eastern school have already signed up for the instruction and have started training. Although called a course in "aerial observation," the work will teach the nomenclature, care, operation, and construction of the modern airplane. Later in the year, a course in piloting is to follow, to be accompanied by study of aerial navigation, meteorology, and the theory of flight. The college has purchased a biplane of the type widely used for elementary training of army pilots.

FISH TRAP OF HUGE CAPACITY FOLDS INTO SMALL SPACE

Salt-water fish that travel in schools near the surface, such as herring, mackerel, cod, and bluefish, are confronted by a new menace, while the markets are promised a plentiful supply of sea food next season. A Boston market fisher-

A Small Working Model of the Fish Trap: The Inventor's Right Hand Indicates the Entrance to the Trap

The Full-Size Trap, Knocked Down for Packing on Shipboard, Consists of a Pile of Hoops, a Few Curved Floats and a Number of Barrel Buoys, and Takes Up Very Little Room

PHOTOS COPYRIGHT, INTERNATIONAL

Assembled by Six Men and Set Afloat, the Trap Is 60 Feet in Diameter, 10 Feet Deep, and Has a Capacity of 1,000 to 2,000 Barrels of Fish

man has invented a floating trap that can be set up or knocked down by six men in half an hour, yet has a capacity of 1,000 to 2,000 bbl. of fish. The netting is arranged on hoops, 10 ft. deep and 15 ft. apart, buoyed up to form a 60-ft. circle. Packed on shipboard, the trap occupies little room, and it is declared to have a life of five years. While floating, it is readily towed from one location to another.

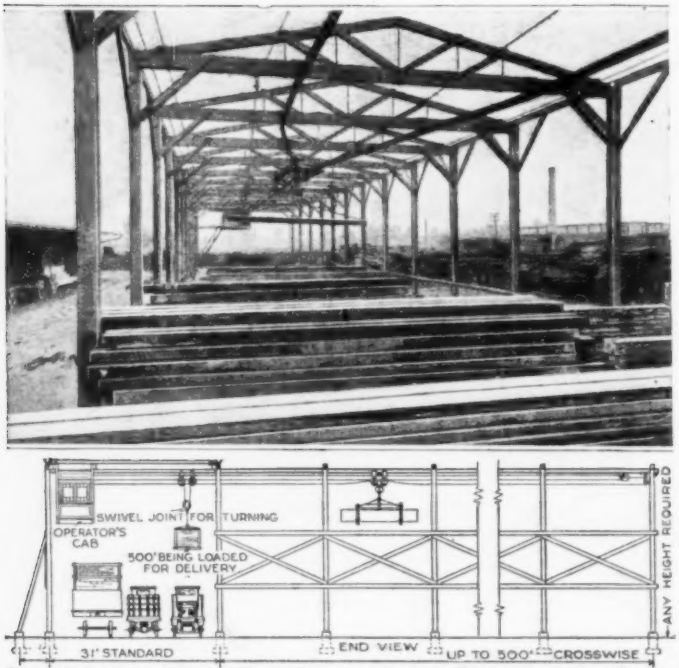
PART RAW AND PART TANNED IS NEW LEATHER BELTING

Rawhide, or leather treated only with water, is far stronger and more durable than tanned leather, and very flexible, but lacks the elasticity demanded of machine belting. Both forms of leather are ingeniously combined, however, in a new belting material invented and used in Italy. The process is to subject the water-treated hide to heavy pressure with a checkered die, making a pattern of alternately compressed and natural leather. The subsequent tanning process does not affect the compressed areas, and the result is a composite leather rendered elastic by the tanned portions, and durable by the raw portions.

STATE GIVES MEDAL TO ALL CITIZENS IN WORLD WAR

To all its citizens who saw war service the state of Oregon will present a bronze medal, hung from a "Victory" ribbon. On its front the medal bears the inscription "World War Service," with the state seal below. On the reverse side are the words, "Presented by the State of Oregon in Grateful Appreciation of Faithful Services Rendered during the World War."

CONVEYOR SYSTEM DESIGNED FOR LUMBER YARDS

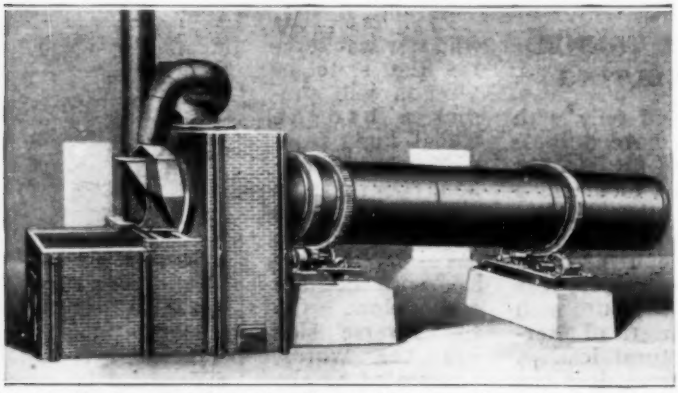


Operation of the Lumber-Yard Conveyor System Pictured at the Top is Best Understood from Inspection of the Diagram Below. The System Speeds Up Delivery and Cuts Down Labor Costs

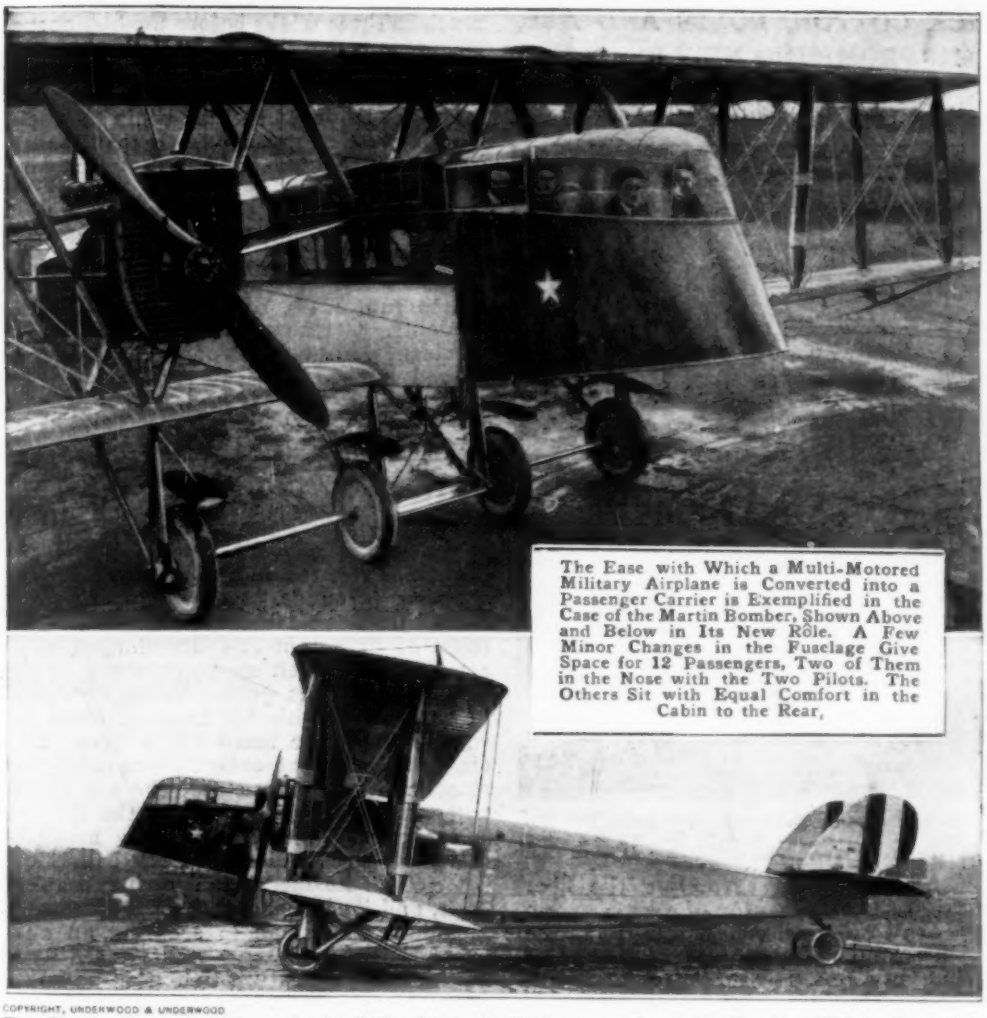
The manner in which lumber is transferred from railroad cars to piles, and from piles to delivery trucks, measures largely the efficiency of the lumber yard. Many concerns will consequently look with favor on a simple conveyor system that does this work quickly and with the help of just a small fraction of the usual working crew. The equipment consists essentially of an overhead I-beam track, on whose lower flange rolls a trolley. From a two-drum hoist two cables lead to the trolley, one passing over a pulley and lifting the lumber to be moved, the other controlling the motion of the trolley. The system is most desirable, of course, when heavy beams form a large part of the yard stock.

MATERIAL IN DRYING MACHINE TURNS IN HEATED DRUM

By completely surrounding material to be dried by furnace gases in a revolving drum, and in some cases tumbling the material through the hot gases, a Pennsylvania manufacturer produces a drying machine declared to yield 65 to 88-percent efficiency. The charge of material is placed in the annular space between the outer and inner walls of the drum. Hereupon the hot gases from the furnace, after having first heated the entering end, pass through flues into the inner cylinder of the drum, out the opposite end, and back through the annular space, the material being tumbled by plates on the cylinder walls while the drying goes on. In another type, the gases do not touch the material, but hug the outer and inner walls of the cylinders. An exhaust fan extracts the gases, moisture and all. By the time they reach the fan, they have given up nearly all their heat without waste.



Drying Machine with Revolving Drum: Hot Gases from the Furnace at the Left Pass through the Hollow Core of the Drum to the End, Then Back through the Material to be Dried, and Out the Exhaust Pipe by Means of a Suction Fan. The Rotation of the Drum Tumbles the Material in the Hot Gases



The Ease with Which a Multi-Motored Military Airplane is Converted into a Passenger Carrier is Exemplified in the Case of the Martin Bomber, Shown Above and Below in Its New Rôle. A Few Minor Changes in the Fuselage Give Space for 12 Passengers, Two of Them in the Nose with the Two Pilots. The Others Sit with Equal Comfort in the Cabin to the Rear.

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The Martin Passenger Plane should Differ Little in Performance from the Bomber, Which, It will be Remembered, Has a Speed of Nearly 120 Miles an Hour with Full Load

AMERICAN BOMBER BECOMES PASSENGER CARRIER

The assumption that military airplanes are unable to meet satisfactorily the demands of peace is justified in the case of small craft designed to meet the specialized requirements of combat work. Planes of the multi-engined bomber type, however, are easily converted into excellent commercial vehicles. Freight is carried quite as easily as bombs; with a few alterations, a fuselage is made to rival in comfort a Pullman car. A conspicuous example of this last is the Martin 12-passenger airplane, which was recently flown from Cleveland to the government's experimental field at Dayton, Ohio. It was found that the same qualities that made it a dependable, high-speed bomber, now fit it for quick passenger transport between our large cities. The speed of well over 100 miles an hour is supplied by two Liberty engines, either of which can maintain full flight.

¶ Liberal new provisions for war-risk insurance allow any discharged service man to reinstate his insurance by paying two months' premiums before the first of the year. Within three months after discharge no statement of health is necessary. Those who have paid more than two months' premiums for reinstatement may secure credit for the difference.

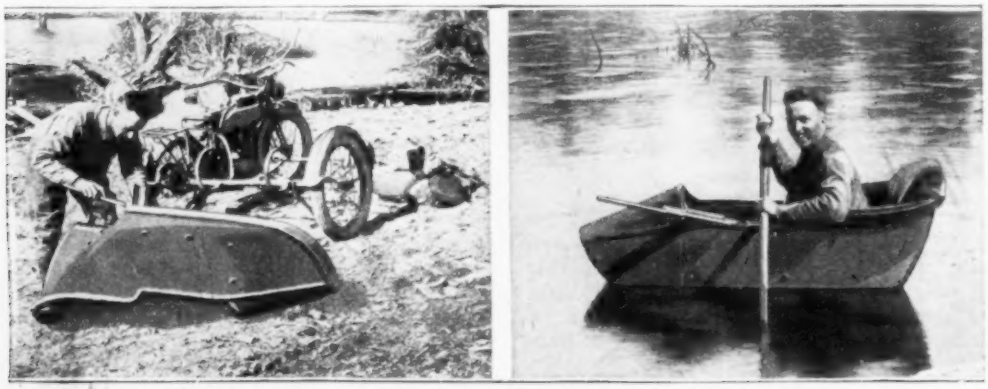
PICK COTTON, BOLLS AND ALL, IN PROMISING NEW SYSTEM

By the simple process of picking cotton in the boll, incubating the crop thus gathered, and then extracting the fiber by machine, the inventor of a new system promises a practical metamorphosis of the whole cotton industry. A $150,000 plant already has proved the practicability of the idea. The success of the method rests on the discovery that cotton matures as much as three weeks before the hull opens, and actually deteriorates from the time the boll first cracks. Under the new plan, the bolls are picked, with considerable saving of labor, when they begin to crack. The harvest of green bolls is then loaded into a machine, incubated in steam-heated chambers, and finally opened by simple mechanism. In 55 minutes, or less, all of the contained cotton is delivered ready for the gins. One machine unit produces one bale an hour, requiring 20 hp. to run, 20 lb. of steam, and two attendants. Cotton so picked is declared to be cleaner, brighter, stronger, and longer-fibered than the staple as handled at present.

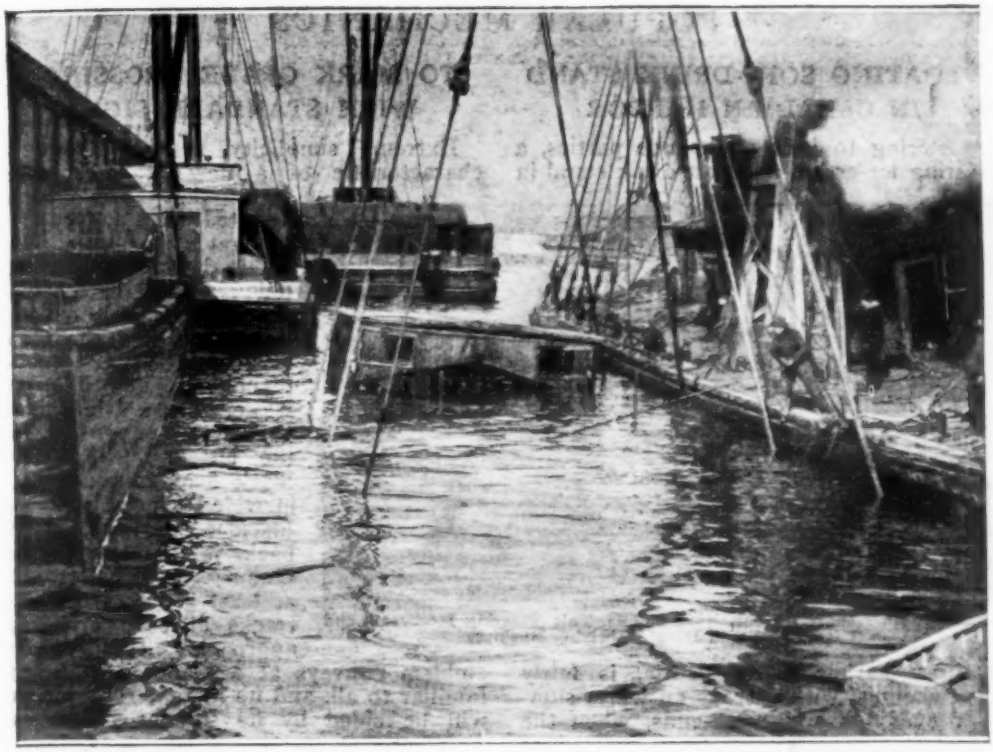
Cotton Mechanically Extracted from Bolls, Fed Unopened to the Machine, is Seen Issuing from the Gate. In the Corner, Is an Artificially Opened Boll

MAKES EMERGENCY DUCK BOAT FROM MOTORCYCLE SIDECAR

On the opening day of the duck season at Baldwin Lake, Calif., last fall, a strange craft was sighted in the eelgrass of the shooting grounds. Its occupant was known to have motorcycled in over 150 miles of mountain and desert road, and then to have been so unfortunate as to find all the boats gone. When he came in that night with his limit of birds, it was seen that he had made a queer but efficient duck boat out of his motorcycle sidecar. Wood plugs closed the bolt holes where it was removed from the frame, and a can of pitch, judiciously applied, sealed all possible leaks. Rock ballast of some 60 lb. steadied the somewhat cranky craft, and its inconspicuousness aided the ingenious sportsman in securing an unusual bag of birds. So well pleased was he with the adventure that now he contemplates constructing a real combination sidecar and boat.



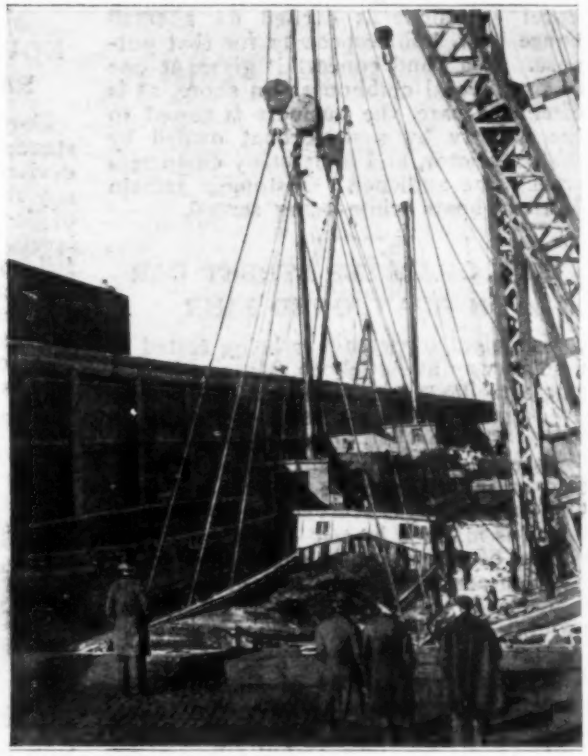
Changing a Motorcycle Sidecar into a Duck Boat: At the Left, the Ingenious Sportsman is Seen Calking the Seams of His Queer Craft, and at the Right, His Ship Launched, He Is on His Way to the Hunting Grounds



The Herculean Power Put into Human Hands by Modern Machinery is Graphically Suggested Above. The Great Booms of the Hoisting Barge have Here Dislodged the Coal Scow from Its Muddy Bed. The Cargo of Coal was Not Affected by the Misadventure

LOADED BARGE SALVAGED BY GIANT HOIST

The titanic quality of modern industry was recently exemplified by a routine salvage job on the New York City water front. A coal barge, loaded to capacity, had sunk in 20 ft. of water between two wharves. In bygone times, recovery would have entailed a week of submarine "mining" for the coal, even before operations could have been begun on the barge itself. But far otherwise today. A clumsy salvage craft lumbered into the slip and came to rest beside the sunken hulk. Four steel cables, passed beneath their load by a diver, were threaded through three huge blocks. As the engines grunted at their task, the submerged barge stirred on its muddy bed, pushed its cabin above the surface, and in a few hours was floating under its own buoyancy once more.



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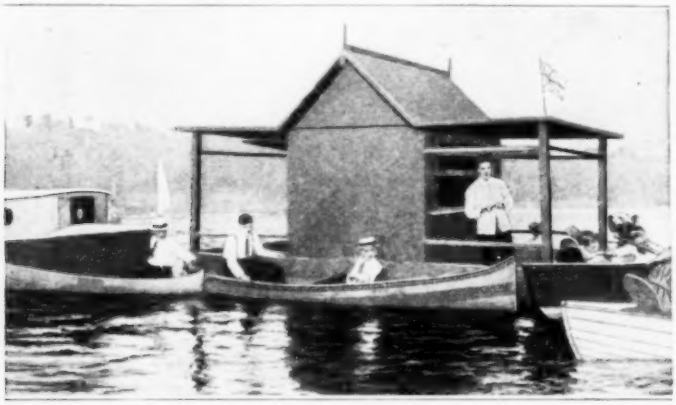
The Heavily Loaded Coal Barge has been Brought to the Surface. The Hoisting Barge is Seen in Part at the Right

FLOATING SOFT-DRINK STAND IN CANADIAN HARBOR

Catering to boat and canoe parties, a floating ice-cream and soft-drink stand in Halifax harbor, Nova Scotia, is fairly overwhelmed with patrons on warm summer evenings and week-ends, when the water is thronged with small craft. The novel enterprise is carried on a small house boat, built especially for that purpose. If a band concert is given at one of the several clubhouses on shore, as is often the case, the business is towed to the vicinity by a motorboat owned by the proprietor, and finds many customers among the audience. Customers remain in their boats while being served.



Anchored in Halifax Harbor, Nova Scotia, This Floating Ice-Cream and Soft-Drink Stand Does a Thriving Business

CITY OPERATES STREET CAR ON ABANDONED LINE

Municipal ownership is being tested in a small way at Attleboro, Mass., where a single trolley car is operated by the city over a stretch of track less than four miles long. The line had been abandoned by a private corporation, and the equipment sold as junk, when the city took charge. One trip is made every hour by the car, which is manned by two crews, each consisting of a motorman and a conductor. A seven-cent fare is charged, and the line is declared to be paying a substantial profit.

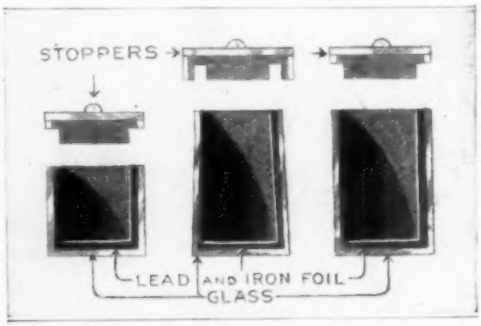
¶Wireless instruments of all kinds, including wave meters and electron tubes, amateur or commercial, will now be tested by the radio laboratory of the Bureau of Standards on payment of a nominal fee.

TO MARK GRADE CROSSINGS WITH STANDARD SIGNS

Extreme simplicity is the strongest characteristic of a new grade-crossing sign that has been adopted as standard by 19 states, to meet new safety laws. The metal pole is 5 ft. high, to catch the rays from automobile headlights, and the sign is a metal disk, 24 in. in diameter. The field is white, with a 1-in. black border, and carries only the letters "R.R." in black, 5 in. high and 3¾ in. wide, defined by 2½-in. black cross lines. The back is painted black. One sign is to be located at least 300 ft. from the tracks at each crossing approach. This simple emblem conveys at a glance a warning familiar to all, and its instant recognition will be aided by its standard form in different states.

NOVEL CONTAINERS PRESERVE RADIOACTIVE SUBSTANCES

For the preservation of radioactive substances a new form of container has been devised, which may be made in almost any shape of bottle or jar. The walls are of glass, two layers thick, and between the layers is a uniform film of iron and lead-foil composition, fused into place. The stopper is built up in the same manner. Any emanations or radiations from the expensive materials are stopped by the lead foil, and deteriorating action on the lead is prevented by the interposed glass.



Cross Sections Showing the Construction of Special Containers for Radioactive Substances, with Lead and Iron Foil between Two Layers of Glass

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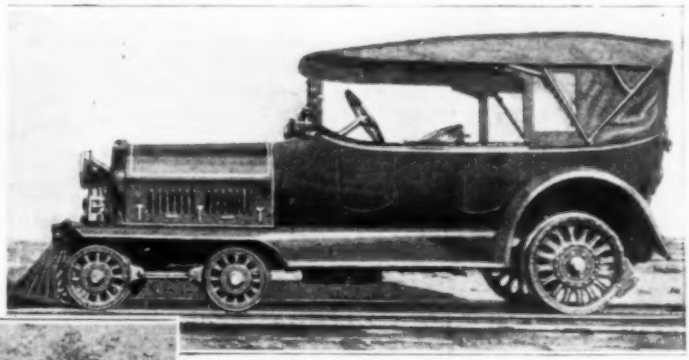
GERMAN WOMEN ADOPT NEW SPORT

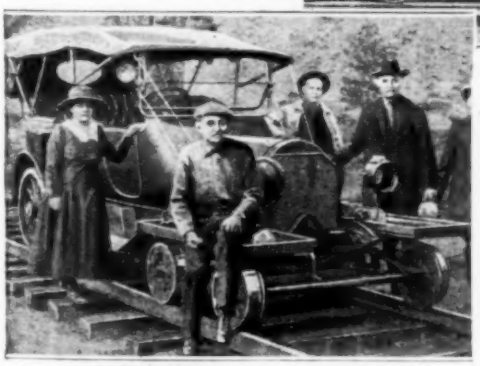
THE women of Germany were introduced to a new sport recently, during an athletic carnival in the city of Berlin. The event took the form of a march, or procession around the grassy field, each marcher being provided with two alpine sticks, and with two long, heavy wooden shoes, or skis. Spectators in the stands found much to amuse them in the entangled contortions of the unskilled, while the marchers did their best to keep step and maintain their position in the column. The wheellike guard, seen at the end of each pole, prevents its sinking too far into the soil.

RAILROAD AUTOS SHOW NOVELTIES IN DESIGN

Two interesting adaptations of the automobile to railroad requirements are illustrated in the accompanying photographs. One is noteworthy for the ballast platforms, or trays, which have been attached beside the front springs to hold the front truck on the rails at high speed. Stone ballast is usually carried, but the trays are often found useful for transporting heavy baggage. The second car has been converted to its present condition in a railroad shop, and is now used for inspection tours and other official business. For its new service the car is equipped with a miniature cowcatcher, fenders over the front truck, regulation locomotive lighting equipment, and with heavy block brakes.

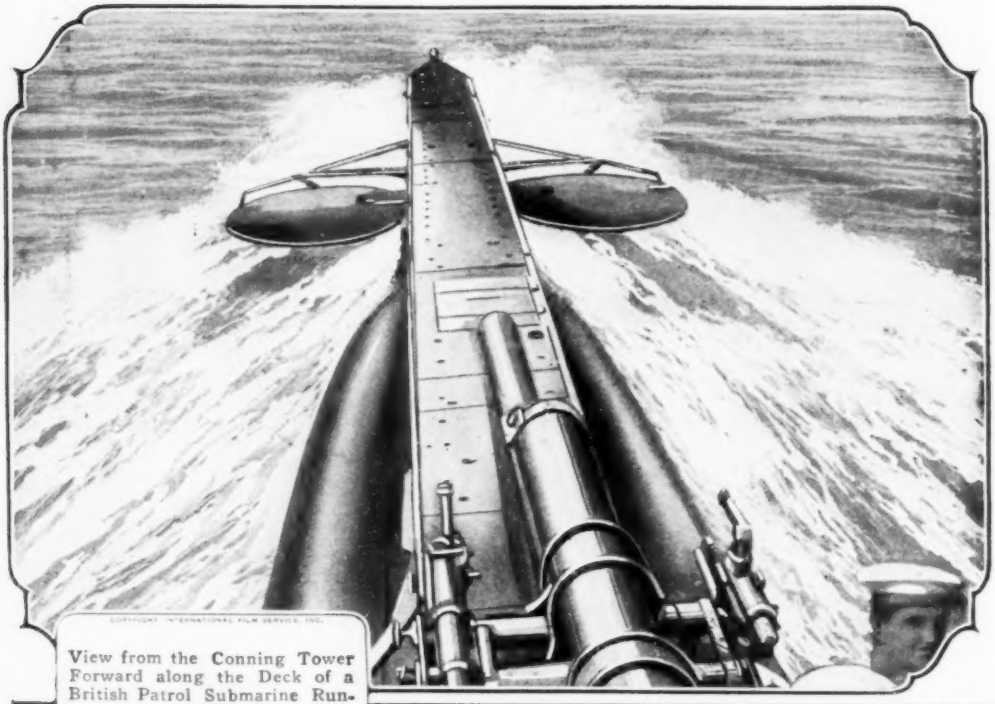


This Big Touring Car was Converted in the Railway Shops into an Inspection Car for the Company Officials. Regulation Lights, Block Brakes, and a Small Cowcatcher Adapt It to Its New Work

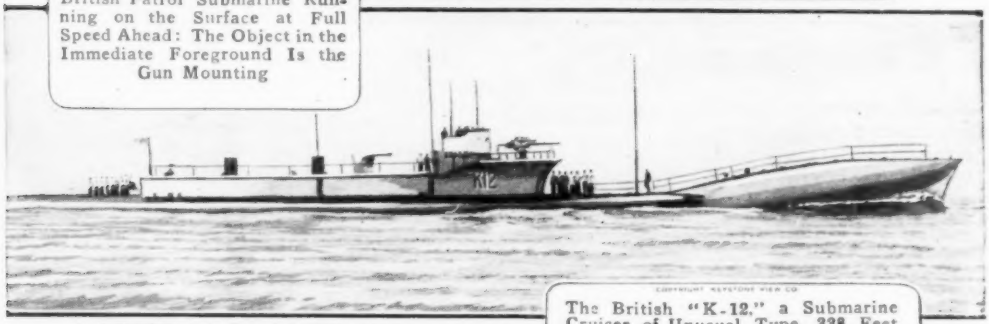


Features of This Railway Speeder Are the Baggage Trays above the Front Wheels

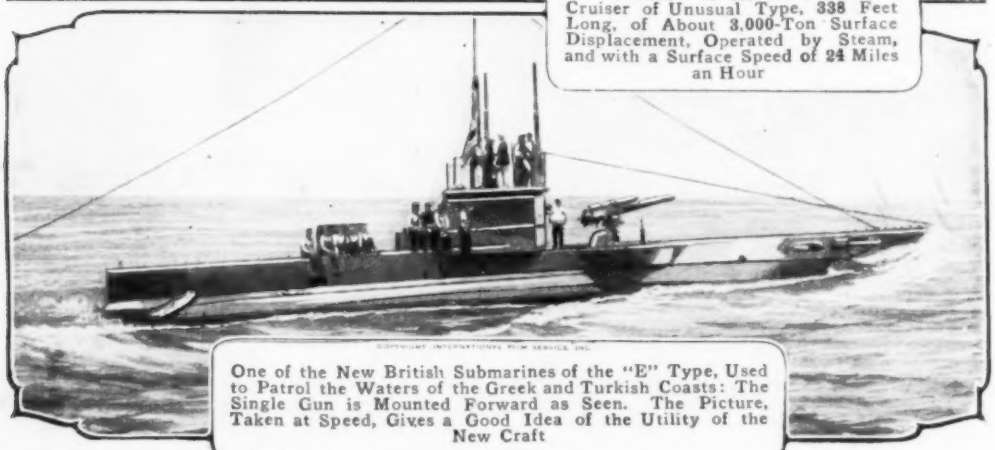
SOME NEW SUBMARINES OF THE BRITISH NAVY



View from the Conning Tower Forward along the Deck of a British Patrol Submarine Running on the Surface at Full Speed Ahead: The Object in the Immediate Foreground Is the Gun Mounting

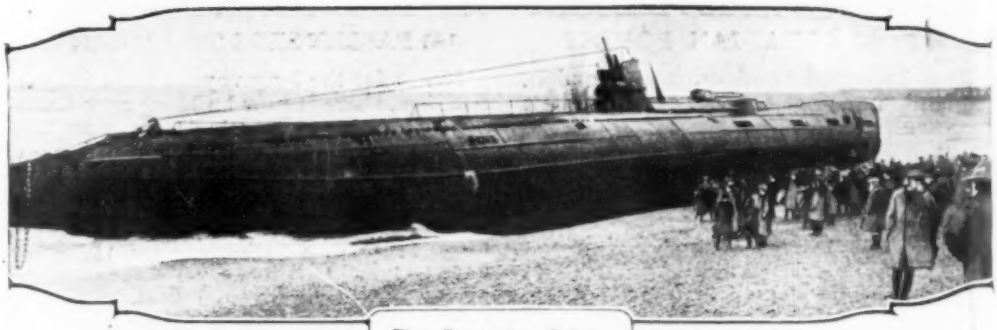


The British "K-12," a Submarine Cruiser of Unusual Type, 338 Feet Long, of About 3,000-Ton Surface Displacement, Operated by Steam, and with a Surface Speed of 24 Miles an Hour

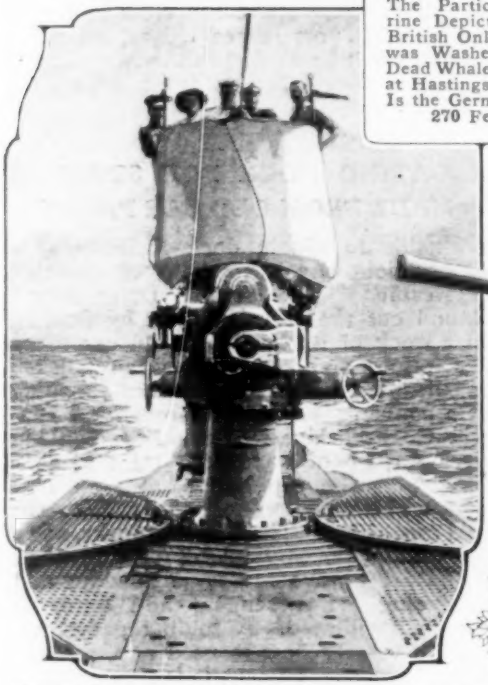


One of the New British Submarines of the "E" Type, Used to Patrol the Waters of the Greek and Turkish Coasts: The Single Gun is Mounted Forward as Seen. The Picture, Taken at Speed, Gives a Good Idea of the Utility of the New Craft

AND GLIMPSES OF OTHER UNDERWATER CRAFT

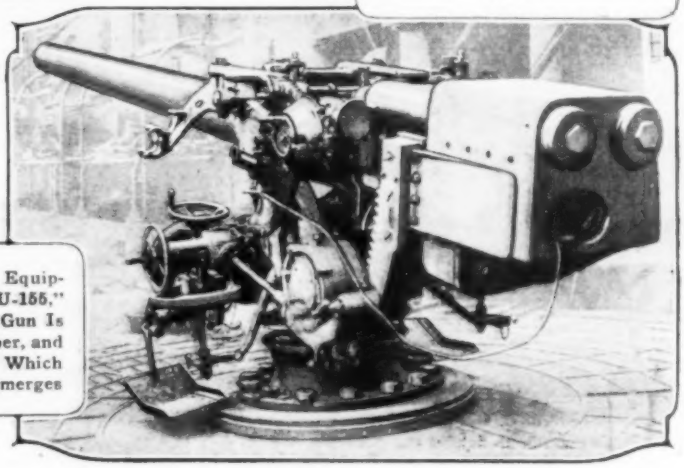


The Particular Submarine Depicted Above Is British Only Because It was Washed Up, like a Dead Whale, on the Beach at Hastings, England; It Is the German "U-118," 270 Feet Long



View along the Deck of a British "E" Type Submarine, Developed for Patrol Duty during the War: The Gun Seen Mounted on the Deck Is Ready for Action, as Are the Men in the Conning Tower

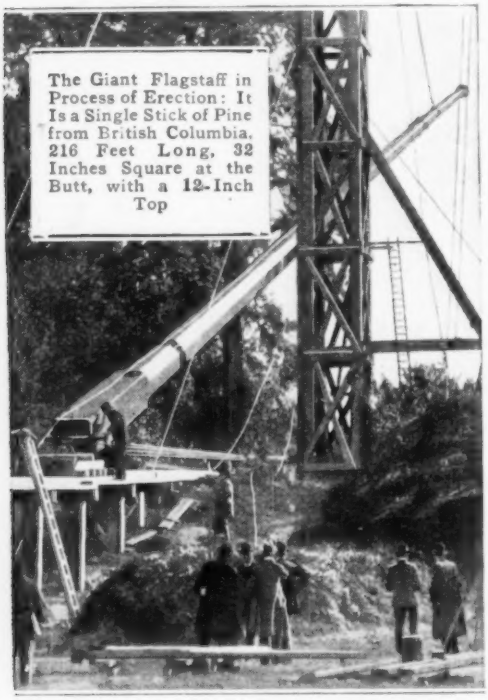
Looking the Other Way at the Conning Tower of the "E-14," Showing the Gun Adjustment, and the Semi-circular Deck Plates, Which are Turned Outward to Increase the Foot Space for the Gunners



A German Submarine's Gun Equipment, Seen on the Deck of the "U-155," Interned in England: The Big Gun Is 20 Feet Long and 5.9-Inch Caliber, and Has a Disappearing Carriage Which Operates When the Boat Submerges

ENGLAND HAS HUGE FLAGSTAFF CUT IN CANADIAN FOREST

Kew Botanical Gardens, near London, England, now boasts one of the tallest



The Giant Flagstaff in Process of Erection: It Is a Single Stick of Pine from British Columbia, 216 Feet Long, 32 Inches Square at the Butt, with a 12-Inch Top

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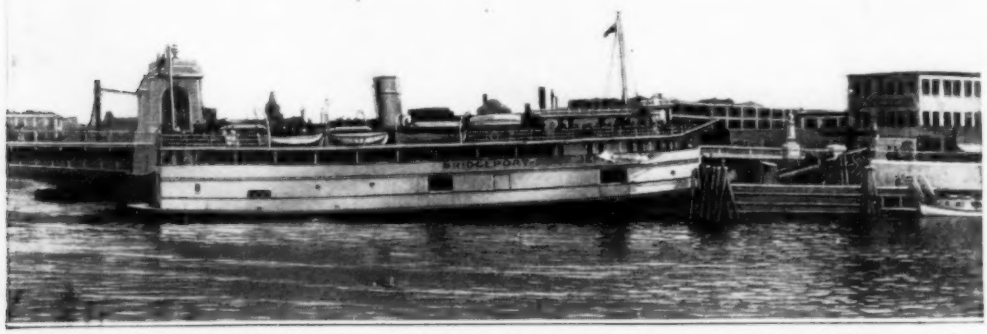
flagstaffs ever made from a single piece of timber. The great stick of clear pine, 216 ft. long, was grown in the forests of British Columbia, and was cut in 1915, as told in the August issue of Popular Mechanics Magazine for that year. The squared butt of the pole measures 32 in. across, and the top is 12 in. in diameter.

ITALIAN DIRIGIBLE TO CARRY 150 PASSENGERS TO AMERICA

Meant for the long voyage from Italy to America, there is now building near Rome a great dirigible which differs from the famous craft of England and Germany in owing little to the genius of Count Zeppelin. The frame is of entirely original design, comprising as it does a hollow metal beam which extends centrally from nose to tail. This huge frame member replaces the usual internal keel, as it not only gives rigidity to the whole ship, but furnishes cabin space for crew and passengers. Report names 150 as the number that will be carried in this way, in addition to fuel sufficient for a voyage of 3,125 miles.

FLOATING DOCK FOR STEAMER MADE FROM OLD CAR FERRY

Unable to obtain dock facilities at a Connecticut city, a company establishing a steamboat line across Long Island Sound cut the Gordian knot by floating in a dock of its own. An old car ferry, 225 ft. long and 35 ft. wide, was refinished for its new duties, and moored to piling at a convenient bridge approach. A runway to the bridge was made by planking over a pair of connected steel girders, hinged at the top and sliding on iron plates at the dock end, to take up the tide movement. The steamer docks, stern on, at the floating wharf, and as their levels are always the same, loading and unloading of passengers and autos is greatly facilitated. A folding gangplank on the vessel's bow is used at the other end of the trip, so that it is never necessary for the steamer to turn around.



The Floating Dock Is behind the Steamer, Which was Not Docked Stern On in Its Regular Manner When the Picture was Taken. At the Right Is Visible the Hinged Incline from the Dock to the Bridgehead

The Façade and Main Entrance of the Memorial Chapel is Seen at the Left; at the Right, an Interior View That Gives a Glimpse of the Pictorial Windows, the Pulpit, and the Carved Choir Stalls

VALLEY FORGE MEMORIAL NEARING COMPLETION

By GEORGE F. PAUL

VALLEY FORGE, that historical center which will always be identified with the heroic efforts of the colonial troops in their struggle for liberty, now has the distinction of possessing one of the most representative and expressive memorial buildings in the entire country. Taking the form of a chapel, it is dedicated to the memory of Washington, and at the same time typifies the entire period of the Revolution. It is intended to house a collection of mementos, almost every one of which is connected with some individual or event of the revolutionary period.

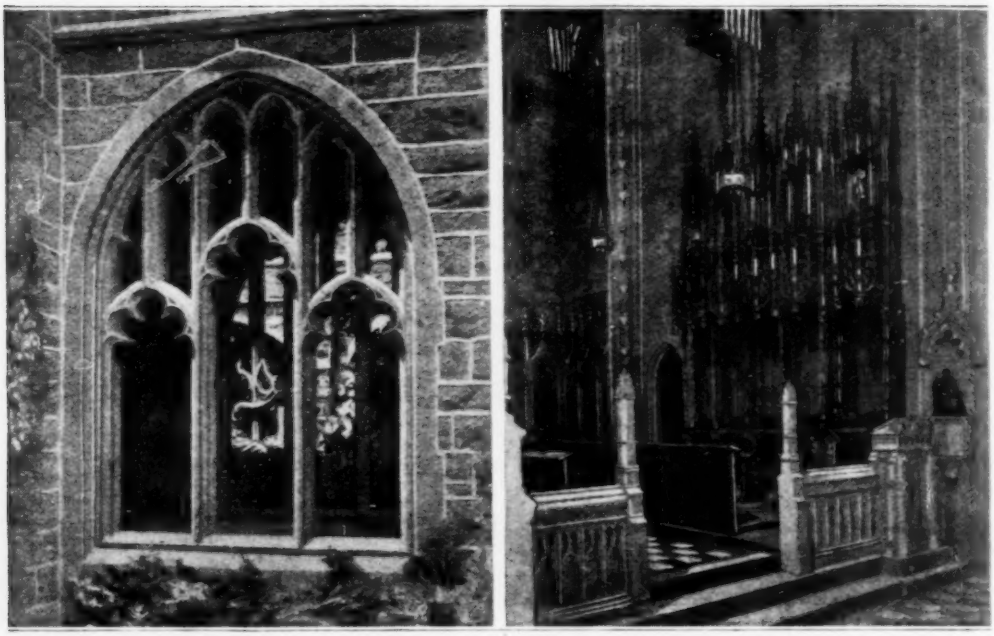
The complete group will consist of a cloister, chapel, and building, containing rooms in which patriotic societies may meet; a library of documents pertaining to the revolution, and a tower overlooking the encampment.

The cloister is divided into 13 bays, each representing the officers and men from one of the 13 original states. Ten are now in place; Rhode Island, Georgia, and North Carolina being the only ones still missing. In the general design of the cloister is included an outdoor pulpit, commanding a natural amphitheater where large gatherings for various purposes may be held.

The interior of the chapel is rapidly approaching completion. Forty-eight panels make up the ceiling. These panels represent all the states of the Union and symbolize the final achievement of the national group. The glass windows will constitute a national history in themselves. They tell the story of the discovery, settlement, and development of the nation in a progression leading up to the west window, which will represent the life of George Washington as told in 36 medallions. The various leaders of the Revolution, including Robert Morris, John Paul Jones, Thomas Jefferson, John Hancock, and others, will be depicted in other windows.

The choir stalls are of carved wood. The figures in the niches at the top of these stalls represent the uniforms of the continental commands, and above them will be hung facsimiles of the colors carried by the troops. The complete series will consist of 16 flags, including two of the French regiments that served in this country during the war.

The planning of the memorial dates as far back as 1903, but the construction of the buildings was not begun until some years later. Interest in the undertaking was kept alive, however, and it is to be



One of the 13 Bays into Which the Cloister is Divided, Representative of the Original States, is Seen at the Left; the Right View Is a Detail of the Carved Choir Stalls, with Figures of Colonial Officers in the Niches

hoped that additional monuments will be incorporated in the memorial from time to time and thus make it a continuously living project.

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DIVISION GOES OVERSEAS TO POLICE SILESIA

A PROVISIONAL division of 5,000 United States regulars, under a brigadier general, recently crossed the Atlantic to supervise the coming plebiscite in Silesia. The cheerful group above, from the 50th Infantry, formed part of the division, and was photographed near the stern of the "President Grant" a few moments before the departure from Hoboken, N. J. The regiment was formerly post garrison at Camp Dix, N. J., and was the first contingent of regular troops to leave the post for Europe since the signing of the armistice.

WRECK OF ANCIENT GALLEON YIELDS PUZZLING RELICS

Some interesting relics have been found by divers who are exploring the wreck of an ancient galleon, presumably one of the ill-fated ships of the Spanish Armada, which was sunk in 1588 near the western coast of Scotland. Among the things brought to the surface are numerous rounded stones, 3 to 4 in. in diameter, and a quantity of lead and copper in sheets. These were puzzling until an explanation of their presence on the ship was found in the written orders issued to the historic fleet just before it sailed from Spain on its voyage of misfortune. The papers stated that the stones were carried for throwing at the crews of enemy ships when vessels were engaged at close quarters, while the sheeting was used to cover the decks of fighting craft to protect them from artificial fire, at that time used in naval warfare. A digging machine and a high-pressure stream of water are being used to remove the mud which covers the wreck.

GAS BOMB SHIELDS CONTENTS OF SAFES AND VAULTS

Poison gas foils would-be robbers who blow open safes or vaults equipped with a new protective device. A thin glass bottle, filled with chemicals, is placed in a metal holder inside the doors. When an explosive is used to break them open, the concussion shatters the flask and releases its contents. Exposed to the air, the chemicals form a gas which suffocates and causes temporary blindness.

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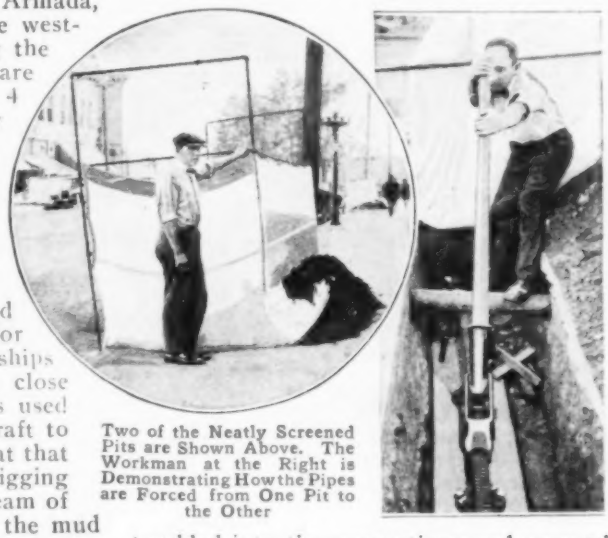
¶ For the construction of masts to support wireless aerials, electric cables, lamps, etc., the German army found a way to use wood strips, ⅝ to 1½ in. square, in place of iron. Some of the masts were as high as 50 ft., with sides either parallel or tapered, and proved remarkably strong.

JACKING CONDUITS PREVENTS MUTILATION OF PAVEMENT

Pipe-laying activity in a city street is usually a matter of long trenches bordered by unsightly rubble piles, later tumbled into the excavations and covered by bulging scars on the paving surface. Methods used in the recent installation of a conduit for electric cables, at Los Angeles, Calif., were in pleasing contrast, however. Instead of the gaping trenches usually sunk through the torn pavement, small pits were dug every hundred feet, each one surrounded by a neat canvas fence which shielded the workmen from the sun and prevented the wind from scattering the dirt. With no further digging, a length of pipe was laid in each pit, capped by a tough steel point, and forced through the earth to the next pit by means of a powerful jack. The work was thus quietly completed with a minimum of inconvenience and annoyance to the public.



Two of the Neatly Screened Pits are Shown Above. The Workman at the Right is Demonstrating How the Pipes are Forced from One Pit to the Other

MAGNETISM DETECTS FLAWS IN RIFLE-BARREL STEEL

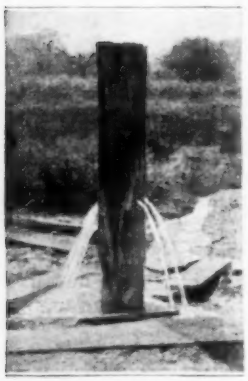
Minute cavities and other flaws in steel bars used for making rifle barrels, are readily detected and located by a magnetic testing process developed by the U. S. Bureau of Standards. So sensitive is the test that care must be taken, in using it, to avoid rejecting bars whose defects are too small to be of consequence. The apparatus has been installed at the plant of a large manufacturer of firearms.

TOUGH BARK OF DESERT PLANT SHIELDS TREES FROM RABBITS

The shields of woven wire, or of tin, used in the past to protect sapling fruit trees from the gnawing teeth of jackrabbits and cottontails, have lately become very expensive. An infant industry now exists, in consequence, for the manufacture of cheap shields from the bark of the yucca plant. It grows in the arid regions of the Southwest, and after a little bruising allows its bark to be slipped off. Drying, this bark becomes so tough that it defies the sharpest teeth of the familiar field pests. Perforations are made to permit access of air to the young sapling.

WATER FLOWS FROM OLD FENCE POST ON OHIO FARM

Some mysterious natural force has transformed an old fence post on an Ohio farm into a fountain. Streams of water have been flowing from holes in the wood for several months, and show no sign of diminishing. One theory is that the lower end of the post taps an underground spring, which finds an outlet through channels formed as the wood decayed.



MANY SEALSKINS OBTAINED FROM PRIBILOF ISLANDS

An enormous shipment of sealskins, valued at $3,000,000 arrived in this country recently from the Pribilof Islands, which are located off the coast of Alaska, in Bering Sea, and owned by the United States. The consignment included 26,185 pelts, weighing 500 tons, and represented the islands' production for 1919. After the hides are tanned and dyed, they will be sold at auction in St. Louis, where fur buyers from all parts of the world gather to make their purchases. When the skins arrived, they were packed in brine-filled casks, 16 to 40 pelts in each container. The shipment was carried by a government boat.

WINDSHIELD SPOTLIGHT MOVED WITH NEW EXTENSION ARM

The awkwardness, and sometimes danger of having to lean over the steering wheel to adjust the windshield spotlight, is responsible for the production of a new auto accessory. It consists of a small telescoping arm, with clamp and universal joint at one end, and ball-shaped handle at the other. Clamped to the spotlight shank, the joint and telescoping arm are adjusted so that the ball handle is always within a few inches of the steering wheel.

GATE VALVE OF SHEET METAL USEFUL FOR IRRIGATION

As a substitute for gate valves of comparatively expensive cast and machine-finished construction, a valve stamped out of galvanized sheet iron has been found wholly satisfactory for irrigation service in the West. The new valves, placed on the market by a California concern, are readily regulated from a drip to full flow, and hold their adjustment until changed. This insures the constant flow of water necessary for proper irrigation with gravity feed.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

The Remains of the Locomotive After It had Passed through Three Freight Cars and Then Exploded: The Cab Portion was Blown Entirely Away, the Rear Portion of the Boiler Wrecked, and the Engineer Killed

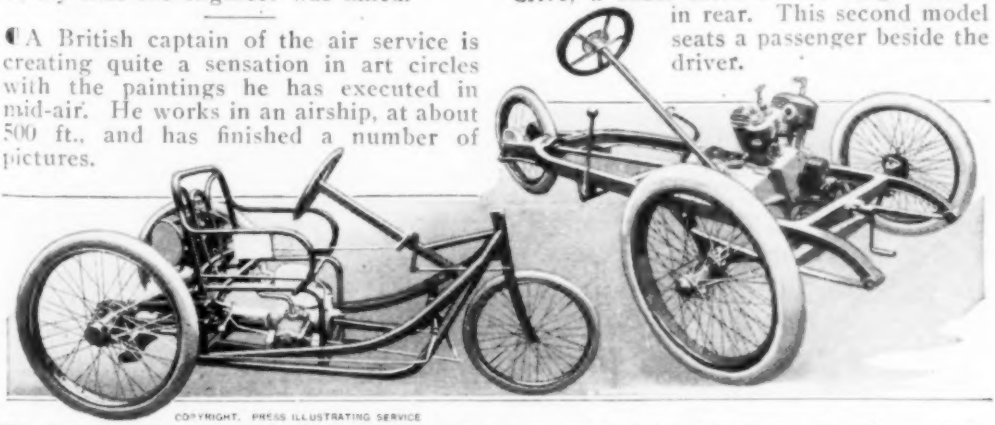
EXPLODING LOCOMOTIVE BLOWS ITS CAB AWAY

A passenger train winding its way through the Ohio River valley on its way to New York a short time ago, crashed into a freight train, and before it came to a standstill, the engine had passed through three of the freight cars. Then, weakened by the impact and strain, the locomotive boiler exploded. The entire cab was blown away by the blast, leaving exposed only a tangled mass of controls, gauges, and pipes. It is almost needless to say that the engineer was killed.

¶ A British captain of the air service is creating quite a sensation in art circles with the paintings he has executed in mid-air. He works in an airship, at about 500 ft., and has finished a number of pictures.

ODD THREE-WHEELED AUTOS SEEN AT PARIS SHOW

Among the many exhibits that made notable the first automobile show held in Paris since 1913, were two three-wheeled cycle cars that drew particular attention. One was of the conventional tricycle type with steering wheel in front; but was unusual in being constructed almost entirely of cylindrical brass tubing. The other was similar to a machine described in Popular Mechanics Magazine for October, 1918, but differed in having, instead of a chain drive, a shaft drive to the single wheel in rear. This second model seats a passenger beside the driver.



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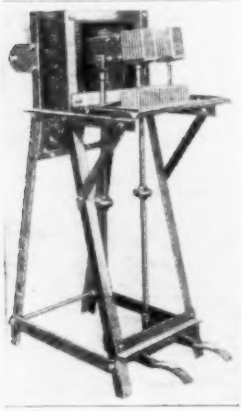
Two Three-Wheeled Cars Which Attracted Attention at the Paris Automobile Show: The Frame of the Machine at the Left is Made of Cylindrical Brass Tubing. The Chassis at the Right Has a Shaft Drive to the Single Wheel in the Rear

HEAT RIVETS ELECTRICALLY WITH SMALL TRANSFORMER

Heating rivets as they are used, with a minimum of power and no smoke, is accomplished by a portable electric transformer now on the market in two sizes. The operator stands two rivets on end on a block of copper, flanged for air-cooling, and allows the two heavy copper electrodes, also air-cooled, to descend upon them. The electrodes are raised by independent pedals at the base of the angle-iron stand. Rivets up to 5 by ⅞ in. are handled, with an adjusting switch for different sizes, and the larger machine will heat five pounds of rivets with an energy consumption of only one kilowatt-hour.



CONCRETE DRYING FLOORS FOR COFFEE PLANTATION

In most coffee-growing districts, the berries, after picking, are spread out on smoothed earth areas to be dried preparatory to the hulling of the beans. The latter are also dried in a somewhat similar way. However, one of the large coffee plantations in Costa Rica has recently improved its drying grounds by paving them with concrete, thus insuring a more sanitary handling of its product. The paved areas are served by concrete flumes or ditches which convey running water over the paved area so that as occasion requires, the concrete surface may be thoroughly cleansed by washing.

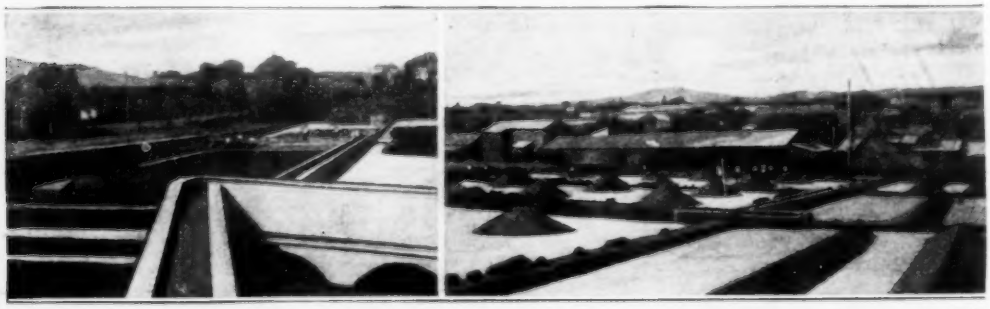
BOATS TO CHASE HURRICANES NEW WEATHER BUREAU IDEA

Weather reporting is generally regarded as the mildest of occupations, but it will become one of the most adventuresome and romantic if the idea of a Weather Bureau official is put into effect. The plan calls for a number of swift, stanch vessels to pursue tropical storms through Atlantic and Mexican Gulf waters and report them by wireless for the protection of the coasts. These storms frequently center far out at sea, without affecting land barometers until it is too late. This was the case with the storm that devastated Corpus Christi, Tex., a few months ago.

FIRST POLISH SHIP SAILS NEW YORK TO DANZIG

The "Kosciuszko," initial ship of a new Polish-American line of steamers, has been put into service between New York and Danzig, after being rechristened at Brooklyn with a bottle of water a short time ago. The vessel formerly was named the "Cape Lookout," and was operated during the war by the U. S. Shipping Board. It is a 7,371-ton freight steamer, with accommodations for 300 passengers. A 5,250-ton freighter of former British ownership is reported also to be in possession of the new Polish line.

¶ In anticipation of possible emergencies, the government plans to salvage American material from the war areas of France, and with it construct a number of narrow-gauge railroads along the Mexican boundary line.



Coffee Drying on Concrete: On the Right can be Seen Piles of the Beans, Ready to be Spread over the Smooth Floor. The Flushing Conduits are Shown at the Left

MARKER HONORS SEWING-MACHINE INVENTOR

Elias Howe, Jr., Inventor of the Sewing Machine, Who was Born 100 Years Ago

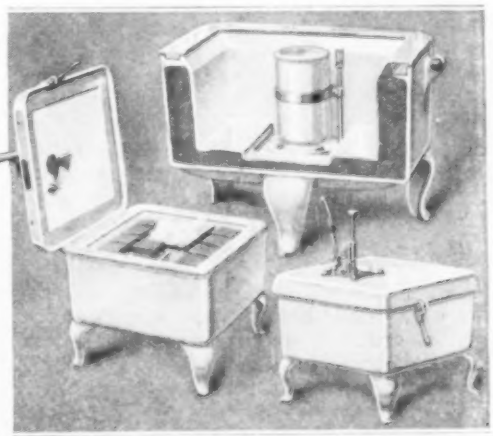
The House, Now Dismantled, in Which Elias Howe and His Famous Uncles were Born

Marker Just Erected at the Howe Birthplace: The Bronze Tablet is Mounted on a Stone Doorstep from the Old Home, and the Base is Made from Another

A bronze tablet, set in a stone slab taken from the doorstep of his old home at Spencer, Mass., now immortalizes the birthplace of Elias Howe, Jr., inventor of the sewing machine. The marker was unveiled on Sept. 10, 1919, the centenary of his birth and the 73d anniversary of his invention, patent for which was granted in 1846, following a history of intense application through poverty and hardship. Another stone step from the dismantled house was used for the base of the marker, which is built of native field stone. The tablet commemorates, also, the names of William and Tyler Howe, uncles of Elias and famous, respectively, as the inventors of the truss bridge and the spring bed.

MACHINE CUTS AND SERVES BUTTER AS NEEDED

To replace the untidy restaurant butter bowl there is now made a small porcelain-finished icebox in which the butter is kept in bulk, and cut by machine as needed. Within the box is a central compartment for cracked ice, with space around it for eight 1-lb. prints of butter, and a third, smaller compartment with a duct and a reciprocating knife in the bottom. As the lid is lowered, a plunger makes contact with a pound print placed in this third compartment. When an individual piece of butter is wanted, a lever geared to the plunger handle is moved down and up, forcing the plunger downward, and simultaneously cutting off the portion of the butter extruded from the duct below. The butter is never touched by the fingers, a fact which highly recommends the device.



The Lid of the Machine has been Raised at the Left to Show the Arrangement of Ice and Butter Prints. At the Right is Seen the Operating Lever, and Above Them a Cut-Away Model Which Shows the Heavy Insulation

NATURALIST TO SEEK ORIGIN OF WEST INDIAN ISLANDS

No less a problem than the origin of the West Indies is to be studied by a naturalist who recently sailed from New York City for Jamaica. Two equally supportable theories are held in this matter by scientists, so the investigator's work will be watched, and his findings awaited, with interest. The first theory makes Cuba, Jamaica, Haiti, and Porto Rico mere fragments of the American continent. It supposes that they were isolated by depression below sea level of the surrounding areas. The second theory sees the islands as independent uprisings from the ocean bed, caused by a combination of volcanic upheavals, foldings in the earth's crust, and coral growth. The greatest hope for a solution of the controversy seems to lie in the animal life of the islands. If it is evidently related to, or obviously descended from, the fauna of the American mainland, the first theory will naturally have to be adopted as the true one.

From Thickly Planted Seed Beds, like the One Above, the Little Seedlings are Plucked, Then are Carried to Portable Transplanting Huts like Those at the Right

The Girl in the Photograph Above is Holding the Planting Board While the Earth is Tamped about It. Upon Removing the Board, the Seedlings are Seen to be Set with the Correct Depth and Spacing. Here the Young Trees Grow, Until, Several Years Later, They are Transplanted Again, This Time at Greater Intervals as at the Right

SPEED AND ACCURACY GAINED BY USE OF PLANTING BOARD

The use of a timesaving tool, called the "planting board," has enabled a Canadian pulp-consuming industry to employ girls and boys for the delicate task of planting the thousands of seedlings which go yearly to replenish the cut-over forest lands. Gathered from the thickly sown planting beds, the little seedlings are rushed to portable canvas huts on the transplanting fields. Along the "boards," which are about 8 ft. long and consist of a number of openings spaced uniformly between two wooden strips, the young workers here insert the seedlings so that the roots protrude to uniform length. The loaded board is then set in a shallow trench while laborers lightly tamp the earth around the roots. When the board is withdrawn the seedlings are evenly spaced and set to the proper depth. Several years later they are again transplanted with wider spacing.

Boys and Girls in These Huts Set the Seedlings into the Wooden Planting Boards. One of These Implements Leans against the Side of the Hut in the Foreground

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¶ To relieve the present shortage of stock for newsprint, and other coarse papers, it is suggested that use be made of stumps in cut-over lands and of the many tons of sawdust burned daily by southern sawmills.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

BAFFLING TELEPHONE MYSTERY CAUSED BY PAIR OF "SPECS"

Apparently of its own accord, a rural telephone line in the remote districts of western Colorado went on strike a short time ago for a 16-hour working day. During daylight hours the line worked beautifully, and inspection revealed no possible cause for the fact that between 9 and 10 every night its telephones went out of commission, and stayed out until morning. Finally, after serious complaint, the manager and a lineman started on a nocturnal trouble hunt. They reached the last house by morning, and were admitted by the aged occupant. Conspicuous on the top of the wall telephone were his metal-rimmed spectacles, resting in electrical contact across the terminals, where it was his habit to leave them every night upon retiring. The mystery was solved.

REINFORCED-CONCRETE SAFETY ISLES IN NEW JERSEY CITY

Unusually substantial reinforced-concrete safety isles of novel design have been constructed in the streets of Newark, N. J., to protect pedestrians from carelessly driven automobiles, and to prevent violations of traffic rules. Ten steel rails are imbedded in each projection, which is in the form of an irregular wall, 7 ft. long, 3 ft. wide, and 4 ft. high. This extends 5 ft. underground. One side is shaped to minimize damage to misguided vehicles which may collide with the structure. On the opposite side is a bench, capable of seating four persons. The isles are illuminated by incandescent lamps, placed on short iron posts, and arranged under reflectors which throw their light downward on the concrete wall. Persons waiting for cars may use the benches.

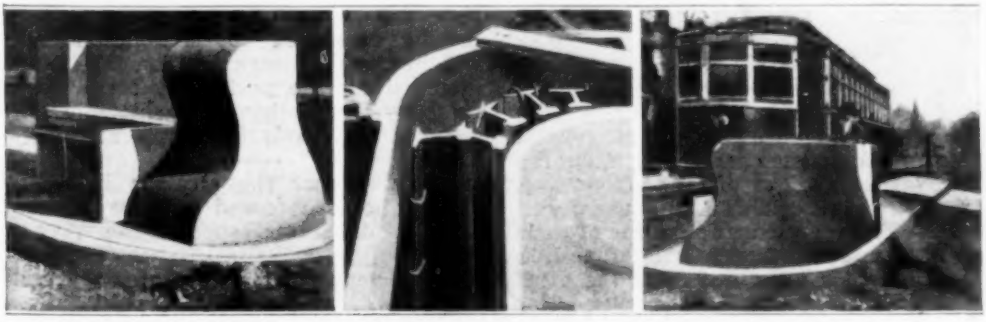
WRITING DESK IS FIXTURE IN LUXURIOUS TOWN CAR

As motor cars become more and more luxurious, their owners display a tendency to add to their equipment some

Folding Writing Desk Attached to the Back of the Driver's Seat in a Recently Designed Town Car: It Serves Also as a Lunch Table When Desired, Supplied from Compartments Alongside

of the normal appurtenances of living room and boudoir. A big town car of recent design includes a folding writing desk, arranged against the back of the driving seat, and containing all the usual provisions for writing materials. Should the occupant prefer eating to writing, a compartment for lunch and vacuum bottles supplies the requisites, and the desk becomes a table.

¶ Commercial radio communication with Belgium has been opened by the U. S. Naval Communication Service, and messages for any point in that country are accepted at 25 cents a word from Washington, D. C. Replies are by cable.



The Views at the Right and Left Show Completed Reinforced-Concrete Safety Isles. In the Center can be Seen a Mold, Containing Steel Rails

BURIED SHELLS ARE LOCATED BY ELECTRIC DIVINING ROD

As the "dowser" of old went about hunting water with his forked witch-hazel stick, scientists now are traversing the shell-marked fields of Northern France with electrical divining rods that have power to locate buried metal. Mysterious as the new instrument appears, it is simply

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Electric Divining Rod for Hunting Buried Shells: The Two Hoops on the Ground Are Balanced Induction Coils

a modern application of the induction balance. The coils are wound on two large wood rings, held parallel with the ground and a few feet apart by a carrying frame. The observer wears a head telephone receiver, and an assistant carries the battery and current interrupter in a box. A buried shell, grenade, or other metal, near either of the coils, sounds its buzzing danger signal, and the workers then proceed to make that patch of ground safe for the farmer.

SPECIAL CLAY CRUCIBLES FOR OPTICAL GLASS

Glass was not the only problem encountered by American manufacturers who undertook to replace the fine optical glasses hitherto imported. For melting the glass, large crucibles of clay are needed, and their requirements are unusual and severe. There must be no danger of their breaking under a heavy load of molten glass, and they must not color the glass or be attacked by its constituents. Not only have domestic producers successfully met these specifications, but they have considerably shortened the drying period previously needed in making such crucibles, and are turning out clay and porcelain of the first quality.

PROVIDENCE TO MANCHESTER ROUTE OF NEW SHIP LINE

Providence, R. I., is preparing to take a new place as an Atlantic shipping port of consequence. A steamer line has just been organized with headquarters in the Rhode Island city, and the first of its ships, an oil-burning freighter of 4,050 tons, has been allocated to it by the U. S. Shipping Board. Manchester, England, will be the foreign port of the new line. An interesting asset of the steamship company is a reciprocal arrangement with lines running out

Box Carried by Assistant, Containing Battery, Interrupter, and Switches for Operating the Detector Coils

of Portland, Maine, and Boston, whereby they will route over the new line all freight consigned to Manchester, and will receive in return any freight that is intended for the ports they serve. The company already has a considerable consignment of goods for shipment.

¶ Realizing that the airplane is handicapped because forced to take off and land at dangerous speeds, the French Aero Club offers 500,000 francs ($100,000) to the inventor of an apparatus that will rise and descend vertically, yet attain a horizontal speed of 200 kilometers (124 miles) an hour.

HARD SPIRITS MASQUERADE IN FUNERAL GARB

It Was in Massachusetts That a Grieving Admirer of the Dead John Barleycorn Conceived the Idea of Holding a Funeral So Complete and Genuine in Its Appointments as to Deceive Those Whose Duty It Now Is to Watch for a Return of Departed "Spirits." When the Coffin, Whose Shipper had Filled It with Quarts and Pints, Arrived at the Station, It was Received by a Regular Undertaker with a Hearse

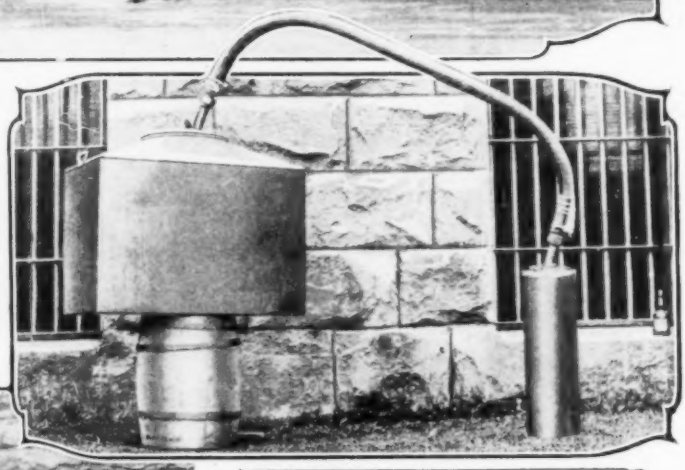
Black-Clad Pall Bearers and Mourners Accompanied the Casket to Its Resting Place in the Private Burial Ground of Its Consignee, and a Profusion of Floral Offerings Bore Mute Testimony to the Sentiments of the Survivors. An Observant Visitor might have Noticed That the Grave Was Unusually Shallow; but the Sheriff, beyond a Few Thoughts on the Mortality of Man, Gave the Matter No More Attention Than It Seemed to Deserve

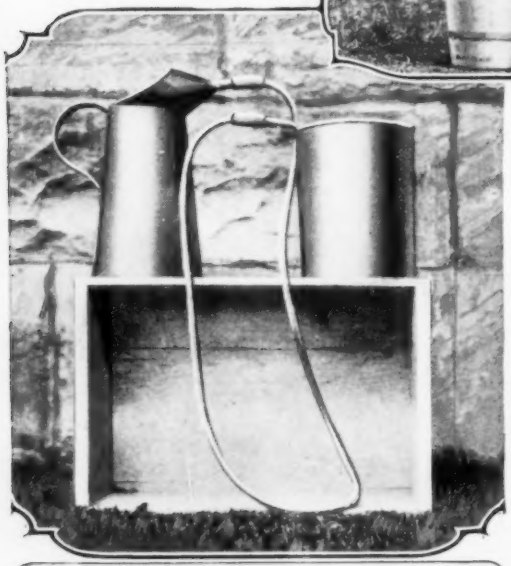
The Disinterment, in the Dark Hours of Night, Was Much Simpler Than the Burial—So Easy, in Fact, That in a Few Nights the "Spirits" had All Arisen, and the Grave Was Empty. It Was the Simplicity of the Process That Led to Its Discovery, for the Temporarily Successful Bootlegger Began to Appear as Chief Mourner in an Astonishing Series of Funerals, and When an Inquisitive Deputy Sheriff Finally Decided to View the Remains, the Obsequies Came to a Sudden End

CLANDESTINE STILLS AND CAMOUFLAGED TIPPLE

Barleycorn's Last Stand in West Texas was Made at Vinton, Just beyond the Ten-Mile Military Zone around El Paso, in a Small Brick Building Whose Title of "Garage" was Scarcely Convincing. For a Few Hours Before the Rangers Closed It Up, It Was the Only Saloon Open between California and Louisiana, and between Mexico and Kansas City

The Stills Whose Likenesses are Presented on This and the Opposite Page Are Only a Few Samples Selected at Random from a Host of Strange and Ingenious Devices, Ranging from Utterly Crude to Decidedly Workmanlike, That have been Captured by the Modern Hunters of Moonshine, upon Whom has Fallen the Mantle of the Old-Time "Revenuers"





The Homemade Distillery Depicted Above, While Simple Enough, Is of Ambitious Capacity, and in Its Brief Career of Lawlessness Doubtless Sent through the Piece of Hose That Constituted Its Coil Many a Gallon of Questionable Spirits. It was Found in a Hollow Cedar Stump 15 Miles from a Washington Town

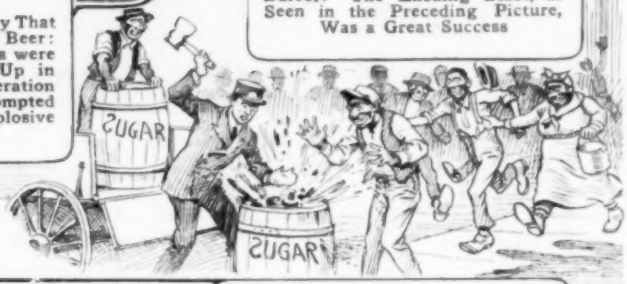
Even Simpler Is the Combination of Bucket, "Measure," and Gas Tube, Intended for Use on a Cookstove, but Captured by State Officers in the Same Town Mentioned Above. Whether or Not So Crude an Outfit as This Ever Produced Any of the Forbidden Fluid does Not Appear, but Many Such have been Seized

The Jug was Intended to Deceive Not the Officers of the Law, but the Patrons of the Bootlegger. Only in the Upper Part Is There a Small Amount of the Illicit Tipple, and under the Paraffin Partition Is Plain Water

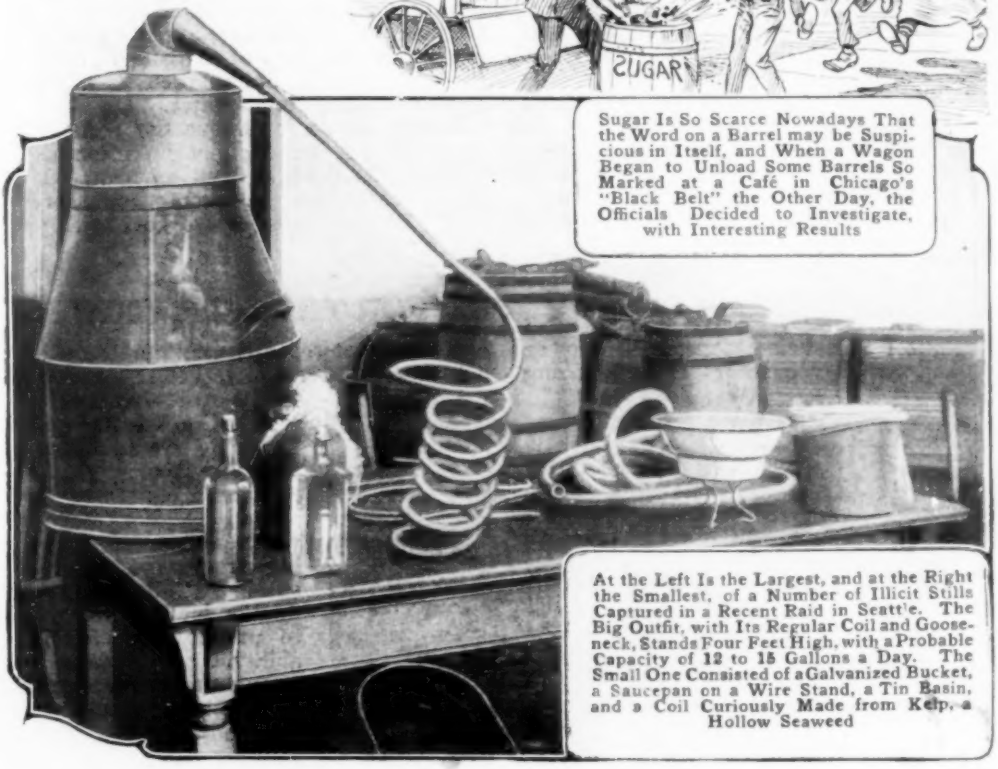
OVERTAKEN BY THE NEMESIS OF THE NEW LAW

Probably the First Time in History That Dynamite was Used to Dispose of Beer: A Few of the 30 Captured Barrels were Emptied into Lake Michigan, Up in Lake County, Illinois, but Consideration for the Welfare of the Fish Prompted the Court to Order the Explosive Method of Dispersion

Officers of the Law Preparing to Execute the Mandate of the Court by Inserting a Stick of Dynamite in the Bunghole of the Topmost Barrel: The Ensuing Blast, as Seen in the Preceding Picture, Was a Great Success



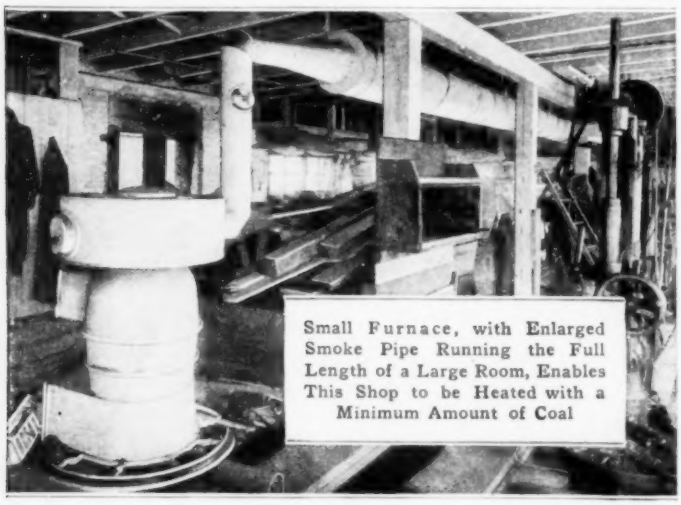
Sugar Is So Scarce Nowadays That the Word on a Barrel may be Suspicious in Itself, and When a Wagon Began to Unload Some Barrels So Marked at a Café in Chicago's "Black Belt" the Other Day, the Officials Decided to Investigate, with Interesting Results



At the Left Is the Largest, and at the Right the Smallest, of a Number of Illicit Stills Captured in a Recent Raid in Seattle. The Big Outfit, with Its Regular Coil and Goose-neck, Stands Four Feet High, with a Probable Capacity of 12 to 15 Gallons a Day. The Small One Consisted of a Galvanized Bucket, a Saucepan on a Wire Stand, a Tin Basin, and a Coil Curiously Made from Kelp, a Hollow Seaweed

BIG PIPE ON SMALL FURNACE KEEPS LARGE SHOP WARM

A machine shop in a Massachusetts city is kept at a comfortable temperature all winter by an ordinary house furnace of rather small size, in spite of the fact that the shop is quite long. The smoke pipe of the furnace is run the whole length of the room, and the portion hung from the ceiling is made up of sections as large in diameter as a barrel. This elongated galvanized-iron drum saves for useful radiation so much of the heat from the furnace that only an insignificant amount escapes up the chimney, the distribution in the room is uniform, and the consumption of coal is reduced to a highly efficient basis.



Small Furnace, with Enlarged Smoke Pipe Running the Full Length of a Large Room, Enables This Shop to be Heated with a Minimum Amount of Coal

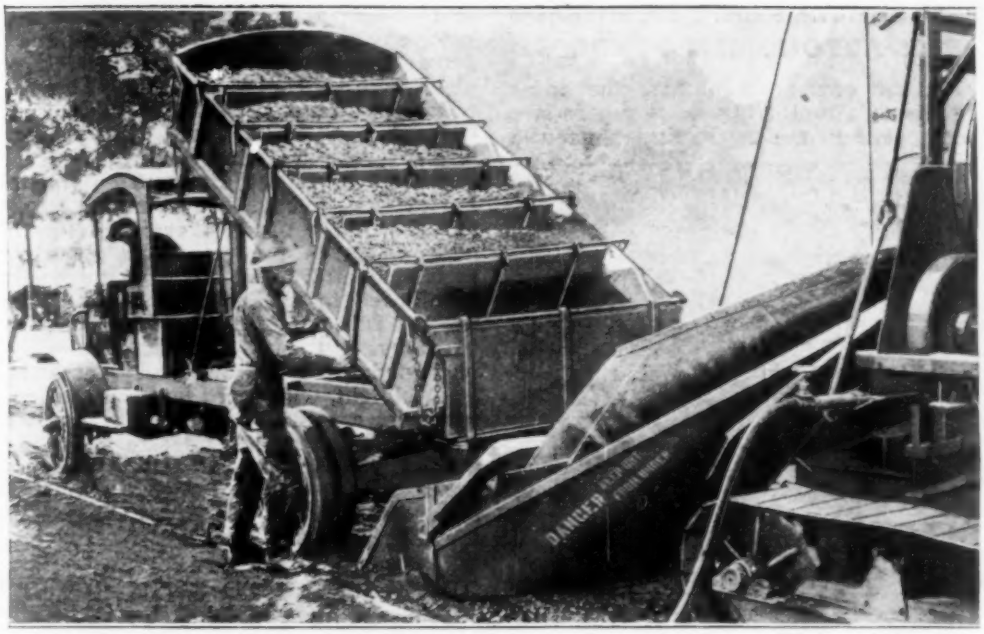
ISLANDS IN ARCTIC OCEAN FUTURE STEEL CENTER

The Spitzbergen Archipelago lies in the Arctic Ocean at about the latitude of northern Greenland, and although discovered in 1596, has never been permanently inhabited. Yet its age-long solitude may now be dispelled, for coal and iron have been found in rich deposits. All along the western coast, where the Gulf Stream warms the climate to a surprising mildness, these two minerals are lying in contiguous abundance, and so close to the shore that the ore could be carried in gravity trams. The possibilities of a thriving export trade are obvious, and in fact are realized as far as coal is concerned. But from a famous arctic explorer comes the suggestion that steel be actually made on the spot for marketing in northern Europe. Despite the month-long arctic night, and the barren isolation of the islands, he pictures the future Spitzbergen as a great steel-manufacturing center. He points out that life so far above the arctic circle need not be drearily monotonous—coal means light as well as heat, while the wireless and the airship could practically always link the workers with the outer world.

LUMBER HILLS CONSTRUCTED FOR TRACTOR EXHIBIT

Natural hills being nonexistent in the region, a farm-tractor manufacturing company that recently exhibited its product in a western city, erected artificial knolls of lumber on which to demonstrate how the machines perform on sloping ground. A wide incline was employed to indicate the practicability of operating tractors across the sides of hills, while a double incline was used to prove their climbing ability. A frame of strong timbers supported the inclines, which were surfaced with heavy planks.

Wooden Inclines Used as Substitutes for Hills at a Tractor Exhibition: These were Built to Provide Uneven Surfaces on Which to Demonstrate the Machines in the Absence of Natural Slopes. The Artificial Elevations Consisted of Heavy Timber Frames, Covered with Thick Boards



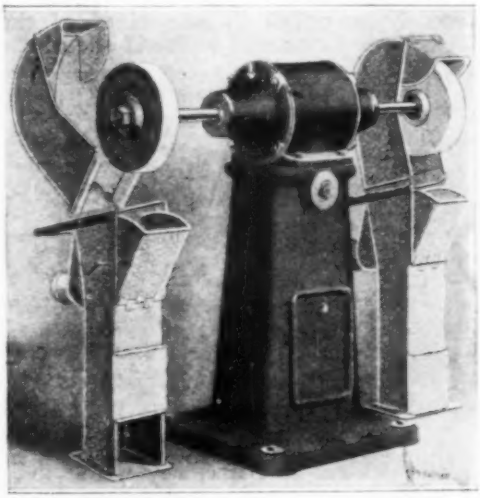
Compartment-Body Truck for Hauling Concrete Material: The Cross Division Boards, Hinged on a Rod at the Top, are Released by a Hand Lever at the Side, and Dump Their Contents, One at a Time, into the Mixer

CONCRETE-MATERIAL TRUCK HAS COMPARTMENT BODY

The use of wheelbarrows for hauling material from truck to mixer, in road-building, or other concrete work, is entirely obviated by a new form of truck body, which is divided by cross boards into compartments to suit the size of the mixer used. The truck has a dumping body, and after being filled with stone and sand by chutes from a bin, is run to the mixer and hoisted. Each division board is hinged at the top, and is held closed by three plungers connected to a hand lever at the side. The boards are released one at a time, each compartment holding one full charge for the mixer. The body is convertible to ordinary forms.

BUFFING LATHE FOR TIRES RUNS ON BALL BEARINGS

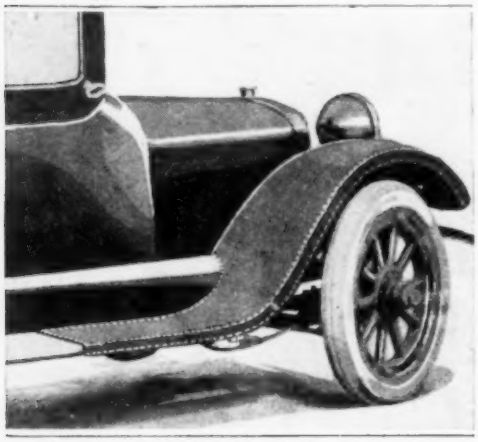
A number of large rubber concerns are trying out a specially designed motor-driven buffing lathe for roughing auto tires. The buffing wheels are mounted directly on the extended ends of the motor shaft, and the whole is supported on an iron pedestal of either floor or bench type. A feature of the construction is that the motor end caps are ball-bearing, with felt washers to prevent oil leakage and dust trouble. These bearings are almost without wear, maintaining the motor armature in the exact center of the field. Machines of ½ and 1 hp. have indicating switches, while the 2 and 3-hp. sizes are provided with automatic starting controllers, mounted in the pedestal. Wheel sizes are from 6 to 12 in., and the motors are for either direct or alternating current.



Self-Contained Electric Buffing Lathe with Ball-Bearing Motor, Shown Equipped with Guards for Buffers

DETACHABLE LEATHER SHIELDS FOR AUTOMOBILE FENDERS

Leather covers to protect the front fenders of a motor car while repairs are being made to the mechanism under the hood are new devices intended to be used in garages. The shields can be quickly attached or removed, and are lined with a soft material which prevents scratches on the highly polished surface, even if tools are placed on them by careless workmen.



Fender Guards for Automobiles: These Leather Covers Prevent the Marring of the Highly Polished Surface by Repairmen

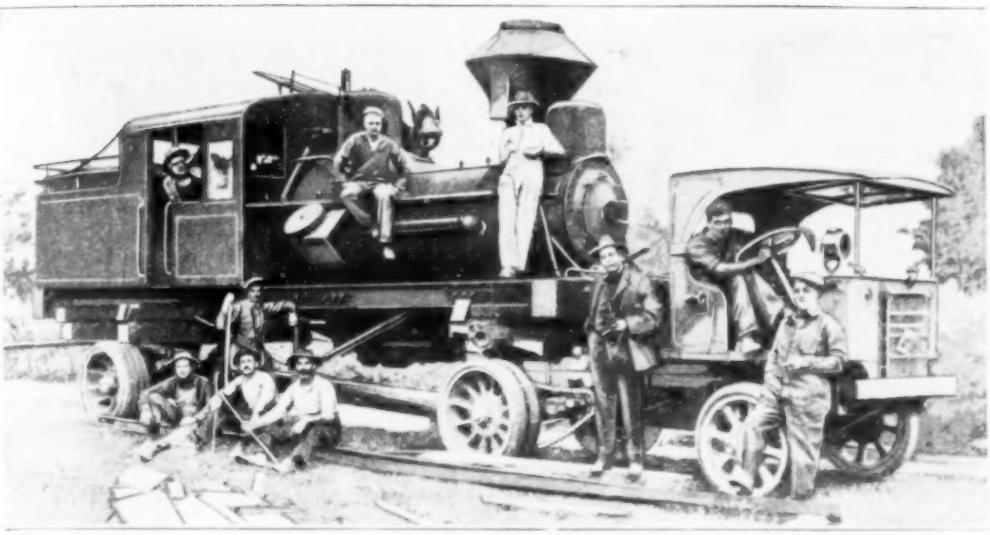
NEW YORK AERIAL POLICE ASK MUNICIPAL FLYING LAWS

The system of flying laws for large cities recently proposed by the chief of the New York City aerial police is one of the first codes to be drawn up, and is suggestive of the drastic regulations that will some day govern the heavy air traffic above every commercial center. The proposed regulations prohibit flight over cities of 600,000 or more, unless pilot, airplane, engine, and flying field be registered with the Police Department. No airplane would be permitted to fly at such low altitude that it could not glide, in case of engine stoppage, to a registered airdrome. No machine would be allowed to fly beyond the city limits without full equipment and fuel sufficient to carry it to its next landing place. Night-flying planes would carry flares and a searchlight, with a red light on the left-wing tip, a green on the right, and two white lights forward and astern. Other articles would establish aerial "rules of the road," govern trial flights of manufacturers' aircraft, and provide penalties for all violations.

COWS LEARN TO SWIM CANAL THAT BISECTS PASTURE

New York State's new barge canal, with a 12-ft. depth and a minimum width of 75 ft., cuts across a number of farms. In Washington County, one dairy farm in particular was bisected in a manner that threatened greatly to increase the labor of getting the cows to pasture. One bold bovine, resenting the long walk around, finally took the plunge and calmly swam across. Not to be "stumped," the rest of the herd followed, and now they all perform the feat daily. With their aid, other herds have been instructed in swimming, and all are said to be benefiting physically by the exercise.

Cows Swimming to Pasture across a 75-Foot Canal That Cuts Their Dairy-Farm Home in Two: This Is the Daily Performance of All the Herds in the Neighborhood, Since One Courageous Animal Showed the Way



Motor Truck Carrying a Logging Locomotive across a "Trackless Waste" of Timber Land, from One Claim to Another: The 10-Ton Tractor Truck was Aided by a Heavy Trailer, onto Which the Locomotive was Hoisted with a Derrick

LOCOMOTIVE MOVES OVERLAND ON TRUCK AND TRAILER

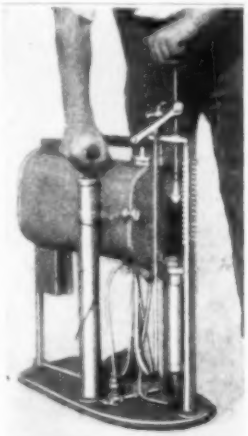
Steam locomotives still do the hauling in the lumber districts, but without a track to run on they cannot haul themselves. In one of the timber workings of the Pacific Northwest, a short time ago, it became necessary to transfer a good-sized logging locomotive from one claim to another, and there was no track between them. So a heavy pair of trailer wheels, with a timber platform and a long log for a tongue, was hitched to a 10-ton motor truck of the tractor variety, and a derrick hoisted the locomotive on board. Lumbering roads, which need no description, were the only thoroughfares available, but the truck delivered its unusual burden to its destination.

PHONOGRAPHS AS SUBSTITUTES FOR PASTORS IN PULPITS

Church congregations will be led in divine worship by phonographs, instead of pastors, if a proposal made at a recent gathering of ecclesiastics becomes a reality. The novel plan provides for the installation of large talking machines in pulpits left vacant by ministers who find their salaries too low to meet expenses, or for other reasons. Sermons delivered by eminent theologians, and recorded in the usual manner, would be reproduced by the mechanical preachers. By this system, according to its advocates, high-class religious dissertations would be made available everywhere.

MECHANICAL "GASSER" KILLS PESTS IN CITRUS GROVES

Once each year the lemon and orange trees of southern California are covered with chemically treated canvas, and fumigated with the deadly hydrocyanic gas to kill a destructive scale. The ingredients, formerly exposed at the base of the trees in open vessels, are now shot into the inclosures by special pumps of the kind illustrated. Danger to the "gassing" crews is thus reduced; yet the process remains a hazardous one. The liquid hydrocyanic acid, at low temperature, is delivered to the orchardists in trucks, as the railroads refuse to handle it. Despite all precautions, however, several casualties mark each season.



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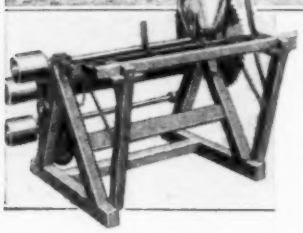
TILTING TABLE SIMPLIFIES USE OF POWER SAW

In every American farming community the coming of the first cold weather is heralded by the metallic song of the buzz saw and the popping obbligato of the gasoline engine. The ax and the bucksaw seem to share the oblivion of the scythe and the hand rake, for the farmer cuts his winter's firewood in modern style. And now he has at his command a refinement in the power saw itself, in the shape of a tilting-table log rack. Placing the log, which may be of any length, upon the rack, the operator moves it, on its hinged legs, against the saw. The cut piece falls, and gravity pulls the table back, permitting the log to be shoved along for the next cut.



The Tilting Table, Seen in Detail at the Left and in Operation Above, Enables the Farmer to Cut into Firewood a Log of Any Length. Gravity Pulls It Back for the Shift between Cuts

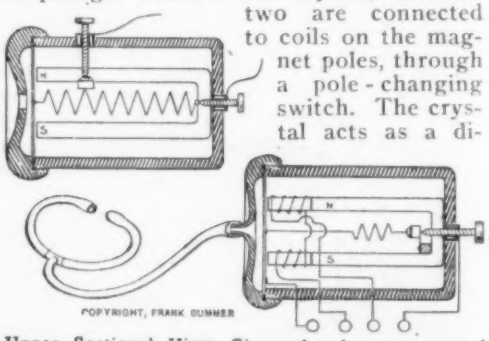
NEW SLIDE-COLORING METHOD GIVES UNUSUAL EFFECTS

A process of coloring lantern slides recently developed by an American scientist makes possible some novel projection effects, and has many advantages over hand-tinting and color photography. A fine colloid film on the glass slide carries the image. Various dyes may be applied in monochrome or mosaic arrangement, or by superimposing a number of films, permitting optical demonstrations on the screen. One experiment is the projection of black and white ruled lines, 250 to the inch, on a screen similarly ruled with alternate red and green lines. A lateral shift of .004 in. then apparently changes the color of the screen. Other colors, of course, may be used.

SIMPLE WIRELESS RECEIVER UPSETS OLD THEORIES

Some cherished theories of wireless-telegraph detector action are upset by a remarkable self-contained receiver just completed by a western inventor. Essentially, it consists of a diaphragm with a spiral spring attached to its center, and a detector crystal making contact with the side of the spring. The poles of a permanent magnet near the diaphragm improve its action. Wireless waves set up mechanical vibrations between the crystal and the spring, which pass on to the diaphragm, producing sound, and proving, the inventor declares, that the crystal detector's principle is electrostatic repulsion, and not "valve" or rectifier action. Diaphragm, spring, crystal, and magnet are inclosed in a small shell with the usual earpiece, making a complete receiving set.

In a modified form, a wire from the diaphragm touches the crystal, and the two are connected to coils on the magnet poles, through a pole-changing switch. The crystal acts as a direct-current generator, either strengthening or weakening the magnet's pull on the diaphragm. Using the weakening position of the switch, undamped waves may be received directly.



Upper Sectional View Gives the Arrangement of Simple Receiver, with Crystal Bearing on Side of Spring. At Right Is the Electromagnetic Modification

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¶ From the Army's Recruit Educational Center at Camp Upton, N. Y., have gone 28 soldiers, all enlisted since May 1, who will demonstrate in 14 eastern cities the results of the intensive training they have already received.

SURF SAILING WITH AN OUTRIGGER IN CEYLON

SINCE the earliest times, the people of southern Asia's broken coast have been known as expert builders of boats. The high, narrow lines of Ceylon's V-shaped craft suggest speed before stability; and it was in these waters that the outrigger was invented, to permit spreading a sail without capsizing. With this primitive but effective safety device, surf sailing becomes a sport fit for Singhalese princes.

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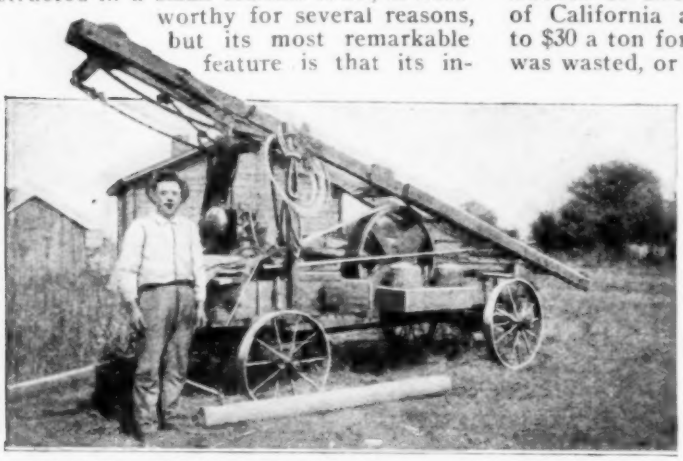
COMPACT WELL DRILLER MADE BY BLIND INVENTOR

A well-drilling machine, recently constructed in a small Kansas town, is noteworthy for several reasons, but its most remarkable feature is that its inventor and builder is blind. He has arranged all the machinery inside its timber bed frame, and the frame inside the standards of a common steel-wheeled wagon, making, with the tower folded down, an extremely compact outfit. A 2¾-hp. gasoline engine does the drilling, and one part of the drill mechanism is reported to be distinctly novel and valuable. The machine has drilled a 6-in. well 70 ft. deep in solid rock in 70 hours, the inventor operating it.



Novel Drilling Machine and Its Blind Inventor, Who Built It with His Own Hands and Operates It in His Business of Well Drilling: It Is Very Compact, and, with Its 2¾-Horsepower Engine, Works Rapidly

GAIN POWER AND NAVIGATION BY DAMMING ST. LAWRENCE

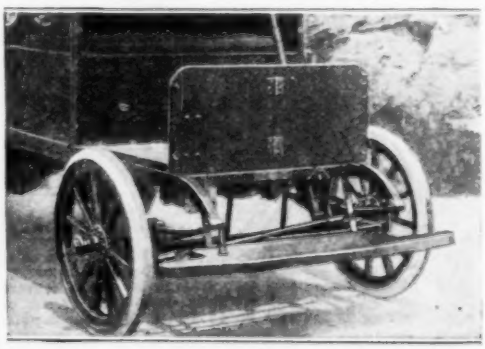
Huge dams across the St. Lawrence River at Morrisburg, Ont., and lower points, now under consideration by an international commission, would supply some 2,000,000 hp. for division between the United States and Canada, and open navigation clear to the head of the Great Lakes. Such a system would make a giant reservoir of Lake Ontario, raising its level about two feet, and opening the new Welland Canal to vessels of deeper draft. Montreal harbor also would be deepened by the rising water, making the entire route from the Atlantic to Duluth available to ocean steamships. Western grain crops could go this way to the sea at much lower freight rates, and shipments from the coast inland would find equal advantage.

CITRUS FRUITS ONCE WASTED BECOME RICH BY-PRODUCTS

Thanks to the scientists of the U. S. Bureau of Chemistry, the citrus growers of California and Florida now get $20 to $30 a ton for the cull fruit that in 1914 was wasted, or sold for $5 a ton. At that time, one or two small by-products companies existed in California, but were able to absorb only a small part of the enormous annual loss in misshapen, bruised, and generally unmarketable fruit. In the past five years, however, the industry has grown remarkably under the stimulus of experiment. From lemons once wasted are now made lemon oil, citrate of lime, and citric acid by the thousands of tons. Cull grapefruit yields candied peel and excellent juices. Among orange by-products, amounting to 3,000 tons each year, are included candied peel, jellies, marmalade, and marmalade stock.

COMBINED BUMPER AND STEP FOR DELIVERY CARS

A new combined bumper and step for electric delivery cars is designed to be fastened ahead of the dash when the front wheels of the vehicles are located so far forward as to make impossible the attachment of side steps. Hinges in the center of the dash permit it to be swung open to allow easy entrance. The device is of wood, bound with iron, and protects the machine like an ordinary bumper.



Bumper Step for Electric Delivery Cars: The Dash is Hinged, and can be Swung Open and Locked in That Position

The Stately Columns and Capitals of the Lincoln Memorial, Now Nearing Completion in Washington, will Soon be Reflected in a Marble-Bordered Lagoon. From the Foot of the Broad Steps, the Pool will Stretch Eastward for More Than a Third of a Mile. No Fountains will Play in the Main Basin, as It is Desired That the Reflecting Surface Remain Undisturbed

"WATER MIRROR" TO REFLECT LINCOLN'S STATUE

ONE of the most important and beautiful features of the Lincoln Memorial, now approaching completion in Washington, and to pay the cost of which congress has just appropriated $175,000, is a huge "water mirror," or pool, which will reflect the colossal statue of the emancipator forming a part of the memorial. The statue is to be in bronze, showing Lincoln seated, and will be placed in the main pylon of the white-marble temple. From this position he will appear to be gazing eastward, in the direction of the Washington Monument, as if in contemplation of that imposing structure.

The water mirror will be in the form of an artificial lagoon, or marble-bordered basin, more than a third of a mile in length and 60 ft. wide, and will extend up to the very foot of the broad flight of steps leading to the main platform on which the statue will stand. About midway of its length the lagoon will have two lateral extensions, each 350 ft. long, thus forming a sort of cross, while at its farthest end will be a supplementary "fountain pool," 300 by 200 ft. in size.

Thus it will be seen that there will be a very considerable total area of water surface in which will be reflected not only the temple and the statue, but the surrounding flower beds and trees, and the blue or clouded sky overhead. No fountains will play in the main pool, for it is desired that its reflecting surface remain undisturbed. This is expected to be the case except in very stormy weather, since the marble borders around the pool will afford protection from all ordinary winds.

This water mirror, which seems to have been suggested by similar features ornamenting the walks around the famous Taj Mahal mausoleum in India, undoubtedly will add vastly to the beauty of the Lincoln Memorial and its surroundings.

PISTOL GRIPS ARE MEMENTOS OF WAR-TIME FRIENDSHIP

Prized possession of an American ex-soldier, lately returned from France, is a regulation automatic pistol with a beauti-

The Two Wooden Pieces in the Grip of This Automatic Pistol were Carved by an Old Frenchman As a Token of His Friendship for a Young American Soldier

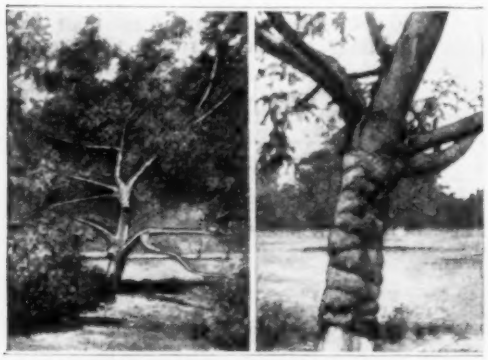
fully carved hardwood grip. As he displays it, he tells of the maker, a loyal French veteran of '70 and a fellow workman in an airplane factory. As an appreciation of his friendship for "l'Americain," the old gentleman with patient

toil carved these two pieces, both of the same symmetrical design, showing a traditional griffin with batlike wings and forked tail.

PERFORM UNUSUAL OPERATIONS ON STORM-DAMAGED TREES

Held together by strong iron bolts, and otherwise reinforced, an ancient elm in a Detroit suburb, and a walnut tree on a California ranch, both damaged by windstorms, furnish notable examples of what can be accomplished by scientific treatment. In spite of their patched condition, these specimens appear to be healthy and capable of living indefinitely. In the case of the first-named, which is about a century old, the trunk was split into three parts, and the heart badly decayed by 20 years of exposure. Tree surgeons removed the rotten wood and applied a disinfecting mixture to the underlying surface. Bolts were inserted about 15 in. apart, to bind the sections together, after which a concrete filling was put in place in layers, with sheets of roofing paper between to allow the stonelike material to shift when the tree is swayed by a breeze. A coat of coal-tar compound was applied to the exposed concrete. The trunk of the walnut tree was in four sections. Before bolts were inserted, the sections were drawn together by using a tractor to operate a block and tackle. Asphalt paint was employed to cover the bruised parts, and the trunk was wrapped with burlap, secured with ropes. The tree has produced good crops of nuts since the operation, which was performed two years ago.

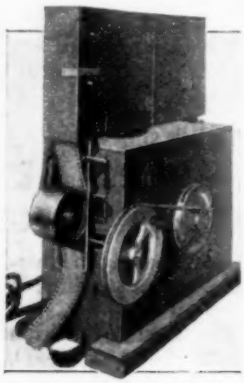
Digging Out the Decayed Heart and Binding the Shattered Parts with Bolts, Tree Surgeons Saved This Ancient Elm



The Trunk of the Walnut Tree at the Left was Torn by the Wind into Four Sections. These were Drawn Together by Block and Tackle, and Wrapped with Burlap and Rope as Shown at the Right

NEW MOTION-PICTURE PRINTER CAN BE USED IN FIELD

Machines for making positive prints from negative motion-picture films are usually rather complicated, because of the necessity of extreme accuracy. However, a California inventor has just brought out a printer which weighs but 8 lb., and measures 14 by 11 by 6 in., making it so portable that it can be used readily in the field and operated by hand. If electrically driven, a motor of 1/200 hp. will run it. It is a contact printer with the feature of positive freedom from scratching or marring of film.



ENGINEERS MUST REGISTER TO PRACTICE IN OREGON

After the first of the year a person who practices any branch of engineering, except military, in the state of Oregon, must be examined and registered by the newly created board of engineering examiners. Engineering graduates of approved schools may take the examination for a certificate if they have had two years' experience in engineering work, and have had charge of such work as chief or assistant for at least a year. For nongraduates, the requirements are six years of work and one year in responsible charge. United States military and naval engineers, however, are eligible to registration without examination within one year after their honorable discharge from service. There is a $10 fee for examination, and a $5 registration charge. The act does not apply to architects, assistant engineers, or those temporarily working in the state.

A HYDROELECTRIC ENGINEERING FEAT IN FAR TASMANIA

The Masonry Dam across the Headwaters of the River Shannon, Changing Great Lake, Seen Glistening in the Background, into an Immense Reservoir for the Storage of Surplus Water: The Power Plant Is Five Miles Down the River

By PAUL H. WOODRUFF

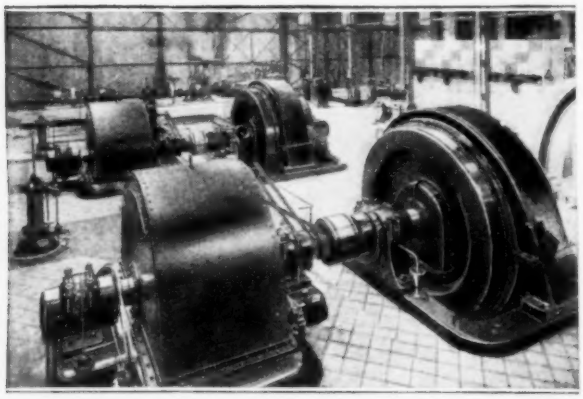
OF all the technical works of man that signal the march of civilization, the hydroelectric development is the most romantic figure. Indeed, it is at once the pioneer of industry, and its most finished achievement. It goes into the wilder ness primeval with all the refinements of the sheltered laboratory; and always it must break its own trail — roughhew its aggressive way against all the obstacles an unfriendly nature can devise. And because nature broke her rule for once, and played engineer herself in the laying out of an ideal site for such a project, the story of Tasmania's hydroelectric development is exceptionally interesting.

Tasmania, island state of the Australian commonwealth, embraces in its triangular outline more than 24,000 square miles of forest and mountain. Disregarding its great mineral riches, it is most remarkable, from the engineer's standpoint, for a central lake of 50 square miles, on a broad plateau, 3,350 ft. high, with a catchment area of 216 square miles fed by an annual rainfall of 35 to 120 inches.

Out of the south end of this Great Lake flows the river Shannon. Parallel with the lake and the Shannon runs the river Ouse—120 ft. above lake level, 1,120 ft. below Shannon level, and only a few miles from either. So much engineering had nature accomplished in readiness for the electrical pioneers: and then added, to clinch the deal, a wonderful natural reservoir alongside the Ouse, just where it was needed as a retaining basin. All the builders had to do, then, was to dam the Shannon at the lake outlet, cut a canal across to the reservoir, and install the machinery.

Great Lake, the Source of Power, is Seen to be Located Almost in the Center of the Island. The Power-Plant Location below It is Marked

Covered by this simple statement, however, are a multitude of tribulations and engineering conquests; of wartime financial difficulties and government aid, with which this story's readers are not concerned, and of ultimate technical achievement, with which, perhaps, they are. The dam at the lake presents no special peculiarities; the rock for its masonry and the clay for its banks were quarried on the spot. It is 644 ft. long and 12½ ft. high, 11 ft. to the top of the spillway, with ten 10-ft.

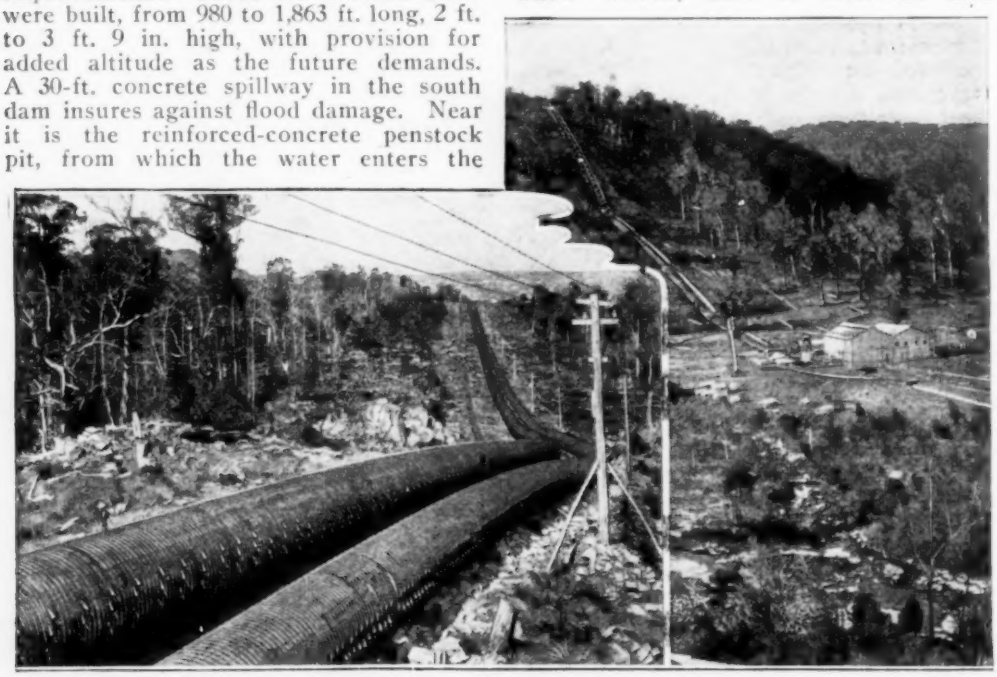


A Pair of Units in the Turbine Room of the Power House: Each Turbine Gives 4,980 Horsepower, and Two More are About to be Added

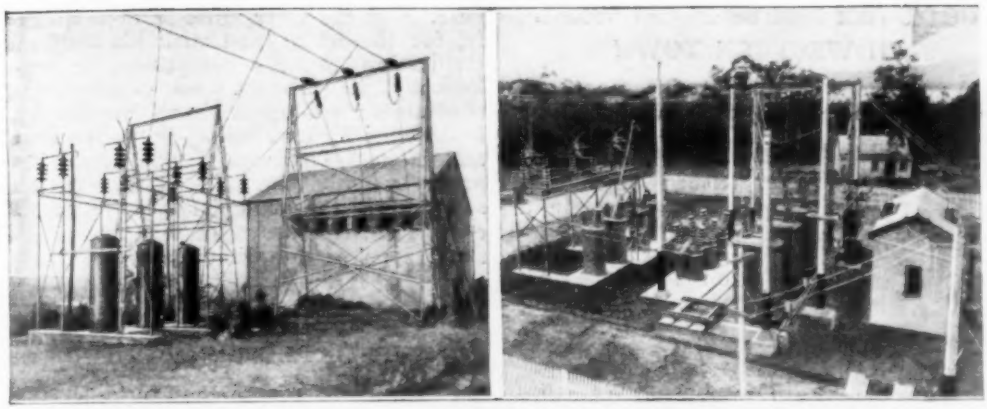
sluiceways. The canal, however, is interesting. It leaves the river Shannon five miles below the dam, and is itself 3½ miles long. In that distance it drops 65 ft., and to check the rush of water a series of drops were built, making miniature cascades, 30 in. or less in height. At the end of the canal is the reservoir, with a surface of 340 acres.

But kind as nature had been, this providential basin could not be used without improvements. Three low earthen dams were built, from 980 to 1,863 ft. long, 2 ft. to 3 ft. 9 in. high, with provision for added altitude as the future demands. A 30-ft. concrete spillway in the south dam insures against flood damage. Near it is the reinforced-concrete penstock pit, from which the water enters the big pipe line. For 5,500 ft., following the configuration of the land through rough clearings, runs the twin line of 4-ft. wood-stave pipe, the second run just recently installed. Assembled on the ground, of selected Oregon staves, and with four relief valves and a vacuum standpipe, the long wooden tubes have given no trouble whatever. The final run of 4,300 ft. to the power house is made in pipes of welded steel, 29½ to 37 in. in diameter, anchored in concrete piers. Thereby the descending water comes finally to the wheels.

They are housed in an unpretentious structure as yet, of steel framework covered with corrugated iron; but the heavy concrete foundation is ready for a more fitting house when there is time for it. Two horizontal turbines, of 4,980 hp. at 375 r.p.m., are running two three-phase 4,050-kva. generators, and two more units designed for 7,050 kva. are about to be added. The generators deliver current to the transformers at 6,600 volts, which is stepped up to 88,000 volts for transmission. The installation of governing devices for the water wheels, and of electrical and



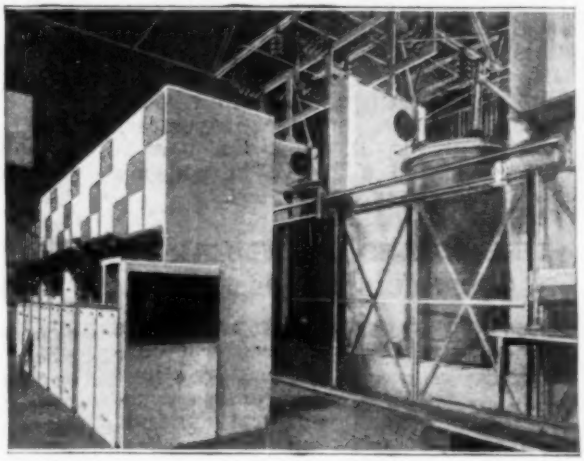
The Big Wood-Stave Pipe Line, Four Feet in Diameter and Over a Mile in Length, is Seen in the Left-Hand View. The Farther Pipe Is a Recent Addition. In the Right-Hand Picture, Is the Power House, with the Steel Pipe Line Coming In over the Hill



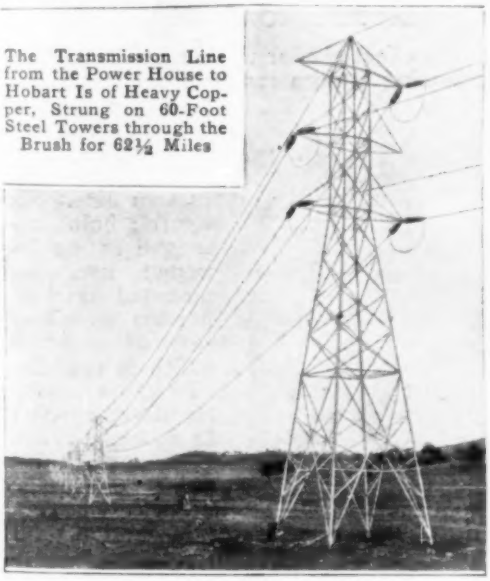
Above Are Views of Two Distributing Substations at the End of the Transmission Line. The One at the Left Is the Main Substation at Hobart, the One at the Right Is at North West Bay, 15 Miles Beyond

protective equipment is complete. Steel 60-ft. towers carry the heavy copper conductors to the city of Hobart, 62½ miles away, and on to North West Bay, 15 miles farther. Here the high voltage is stepped back to 11,000 and 6,600, and then at substations brought down to usable pressures. It is planned to surround the whole city and suburbs with a huge distributing ring, making service available to all the industries of the community.

Little has been said of the difficulties of construction, because they are the common lot of hydroelectric engineers. The building of 18 miles of 42-in. gauge wooden railway through the unbroken forest to a road, and the discovery that the road was a deceptive thing of no bottom, doubtless would make a good story in itself. It is sufficient to say, however, that all these obstacles were overcome without losing any equipment, and that an ultimate 70,000 to 100,000 hp. has been made available in the wilderness.



Step-Up Transformers at the Power House, Where the 6,600 Voltage of the Generators is Raised to 88,000 for Transmission over Long Copper Lines to the Distributing Substations at Hobart and North West Bay



The Transmission Line from the Power House to Hobart Is of Heavy Copper, Strung on 60-Foot Steel Towers through the Brush for 62½ Miles

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¶An extremely durable cloth, recently placed on the market by an English manufacturer as suitable for men's clothing, is made from short silk fibers, heretofore considered almost worthless. According to the producers, the new fabric can be sold for one-fourth the price of the best wool goods. It is made in several colors.

COOL AIR ISSUES FROM WELL IN WESTERN TOWN

A strange well that produces cool air when it is not acting as a suction pump serves to ventilate two homes, between which it is situated, in a western town. Beginning about 10 o'clock each morning, a strong draft, with a temperature of 58° F., issues from the hole. This outflow continues until eight o'clock at night, when the current is reversed, air being drawn into the shaft. Pipes have been laid from the mouth of the well to the various rooms of the residences, and to refrigerators. Though only 15 ft. deep, the bore is supposed to tap a cavern in which a subterranean river has its bed.

TINY SCALES WEIGH MARK OF PENCIL ON PAPER

Shown on its owner's finger tip, the tiny balance in the illustration was constructed by a jeweler, not as a mechanical freak, but for practical use in the watch-repairing business. To demonstrate the sensitiveness of his creation, he obtains a perfect balance with two bits of tissue paper. Then he removes one and marks it with a pencil. On replacing the marked piece, the weight of the pencil line is seen to move the pointer through an entire graduation.

RETURNED SCIENTIST ADVISES HASTE IN STUDYING PACIFIC

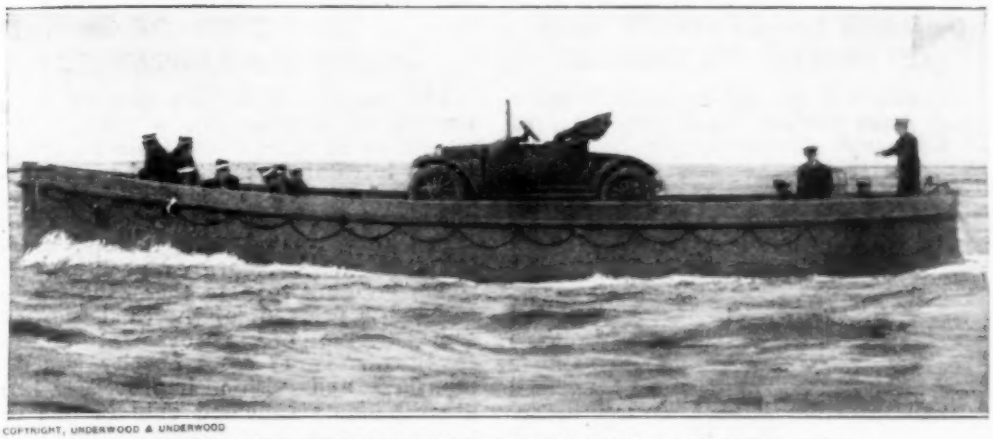
"Haste" is the counsel of a geologist who has recently returned from a scientific expedition in the Pacific Ocean. He declares that its islands and waters offer a fertile and almost virgin field for the investigation of scientists, and of American scientists in particular, for whom Honolulu would be a convenient base. But the work must be done quickly, for the white man with his artificial civilization changes everything. Ethnologically, he absorbs and destroys the aborigines; zoölogically and botanically, he offends by exterminating native flora and fauna. This vast Pacific area comprises roughly one-fifth of the earth's surface, yet the geologist believes that a comprehensive study can be made in the short span of one generation.

SHIELD FOR WELDER'S EYES SUPPORTED BY HARNESS

Designed as a more comfortable substitute for the helmet sometimes worn by welders, a new form of eyeshield hangs from metal straps over the wearer's shoulders. It is held at any desired angle by a chain around his body. A window of special glass is inserted in a sheet of fiber, with a pane of clear glass in front that can be changed when it becomes eroded by the flying particles. The shield slides in guides for adjustment of position, and allows free movement of both arms and head.

ELECTRICAL DANGER SIGNAL FOR RAILROAD CROSSINGS

An effect similar to that produced by a swinging lantern results from the operation of a railroad grade-crossing danger signal, now in use on an eastern line. Six electric bulbs, arranged in an inverted arc, are mounted in reflectors on either side of a board which is supported by a metal standard, about 15 ft. high. When a train reaches a point one mile from the location of the device, an electrical mechanism is set in motion, and the bulbs are flashed in rotation.



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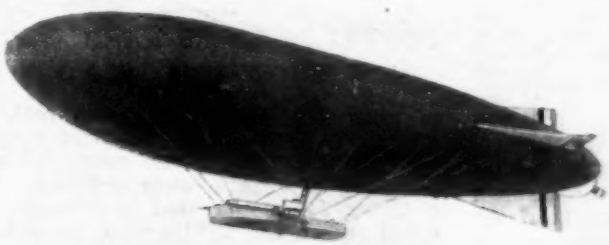
BRITISH OFFICERS TRAVELING BY SEA TAKE CARS WITH THEM

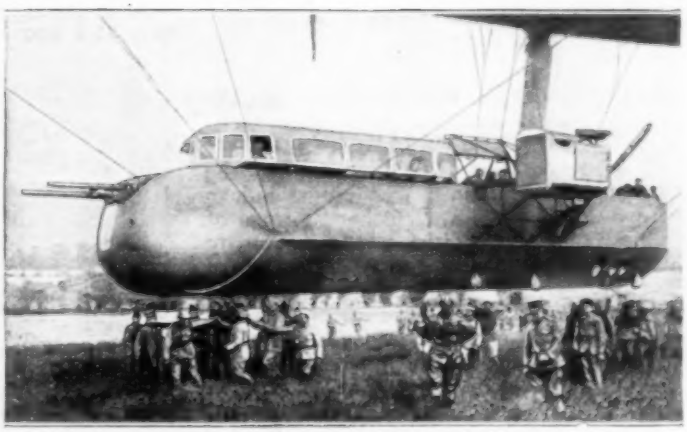
NAVAL officers have less opportunity than others to use their motor cars, and those of the British navy are determined to lose no chance that does occur. Many of their battleships are now engaged in making the rounds of England's many seaside resorts, giving time for some very pleasant hours ashore. The officers, therefore, have received permission from the naval authorities to take their autos with them. The picture shows a roadster, belonging to one of them, being carried by launch from the wharf to a battleship at Spithead, where it is to be hoisted aboard. This performance, of course, is repeated at each port. Every time an officer wants to go ashore quite a crew of men are put to work, manning the hoists on ship and wharf and operating the launch assigned to this important duty.

CANNON ON AIRSHIPS ORDERED FROM FRENCH



The American Expeditionary Force is Said to have Canceled, at the Signing of the Armistice, Orders for Many French Military Dirigibles of This Type

As the French government supplied the American Expeditionary Force with quantities of artillery and airplanes, so, it has recently been learned, they were to have furnished many dirigibles for land and sea-patrol work. The ships were to have been of the nonrigid Zodiac type, about 300 ft. long and carrying a single large car, or gondola. Power is supplied to airships of this class by two engines, mounted upon outrigger brackets on either side of the car. In the bow is carried a special 75-millimeter gun equipped with an ingenious mechanism for absorbing the recoil.



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In Addition to the Usual Machine Guns, the Armament of the Dirigibles Included a 75-Millimeter Gun of the Model Shown. Ships of This Type Served Well on Submarine Patrol and would Probably have been Put to This Use by the American Forces

SMILING YANKS SIT AT EASE ON EX-KAISER'S THRONE

Horror, not to say incredulity, must surely have marked the gloomy features of Germany's former emperor, had he

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American Doughboys Occupying the Ex-Kaiser's Throne: In Their Eyes, No Doubt, the Crowning Achievement of the American Expeditionary Forces

happened into his ex-royal palace at Posen one day not long ago. For on the late royal throne, made of finely veined and carved marble, with the Prussian emblem in precious stones gleaming overhead, sat two American doughboys, at ease in their field khaki. Their nonchalant air cannot conceal the fact that this was no common adventure, but one to make food for narrative through the years.

FACING COAL FAMINE FRENCH TRY SUBSTITUTES

Confronted by a coal shortage, the French government is lending its aid to many experiments with other sources of industrial power. Tidal motors are being built and studied on the north coast of Brittany, while economists announce that, by importing 60,000 tons of gasoline each month, this fuel could be burned in the chief water, gas, and power plants of the public service. Coal moistened with naphtha will probably find some favor, too, the solid being used primarily as a holding element for the liquid, which otherwise could not be handled in the usual fire box.

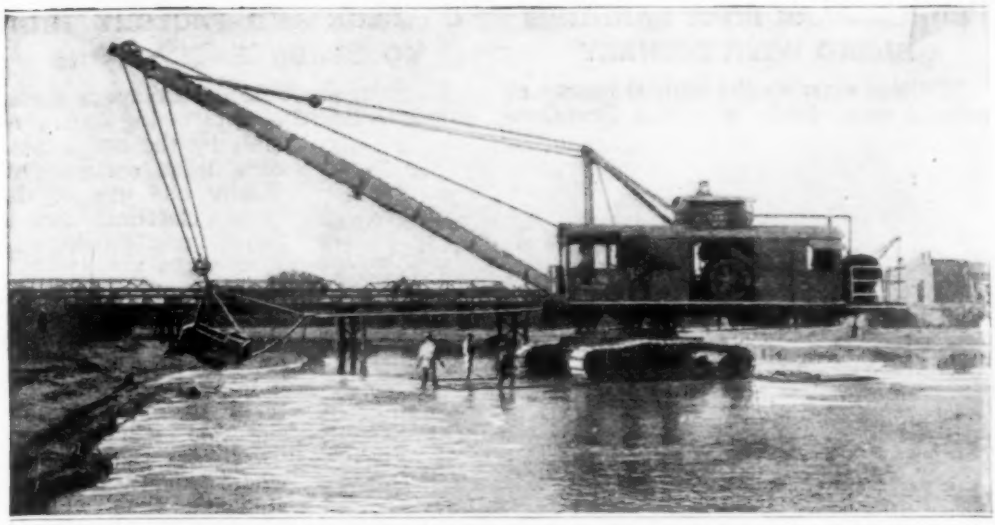
STUDY INFLUENCE OF RADIUM ON CASES OF CATARACT

The success of radium therapy in a number of maladies has suggested the possibility of some effect from its application to cataract, most stubborn of diseases. Two New York physicians have completed a cautious study of 24 cases which they treated with radium, keeping a thorough record of progress. It is encouraging to note that 21 of these cases, 87.5 per cent of the total, showed some degree of improvement during treatment. In 12 cases opacity was diminished and vision improved, while other patients benefited only in one or the other of these particulars. The treatments were continued for from three months to a year, and consisted of applications, at about .8 in. from the closed eyelid, of radium surrounded by brass, photographic paper, and gauze, to filter out the irritating soft rays. With this arrangement, careful examination failed to reveal evidence of harmful effect on the eye structure. The investigators urge that further observations be made.

FOREST RANGERS KEEP WATER IN HUGE HOLLOW LOGS

When the last dry season threatened to deprive the west-coast forest rangers of their water supply, no means of constructing a cistern were available, and a water famine seemed imminent. As a last resort, the insides were hewn from three great logs, and the hollow timbers mounted on a frame alongside the cabin. The improvised tanks held an ample supply, and proved wholly satisfactory.

The Three Logs Supported at the Right of the Ranger's Cabin Are Hollow, and Hold Water for the Dry Season



A 55-Ton Dragline Excavator Crossing the Rio Grande. As No Heavy Bridges Were Available, the Machine Rolled Itself Across with Its Own Power. Heavy Timber "Mats," Bound with Cable, Gave a Footing on the Soft Bed of the River

DRAGLINE EXCAVATOR CROSSES RIO GRANDE UNDER OWN POWER

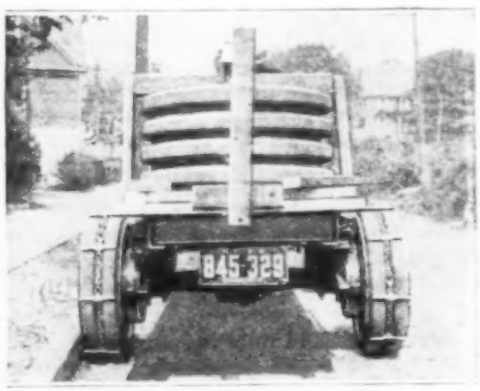
The "seagoing hack" of popular mythology had its counterpart in fact not long ago, when a great dragline excavator crossed the Rio Grande under its own power. Although the big machine moves on broad endless treads, the river bed was so soft at the point of crossing that heavy "mats" were made of timbers bound with cables. As the excavator crawled along, these mats were picked up and lowered before it. The equipment is the property of the U. S. Reclamation Service, and was sent across the river in this way because of the absence of heavy bridges.

CHARCOAL FROM MILL WASTE BY DISTILLATION PROCESS

Mill waste is carbonized and turned into good, dense charcoal in six hours by a new process, the economy of which has been demonstrated recently. A closed air-circulating system includes a fan, a stove for heating the air pipes, a condenser and an electrical precipitation unit for extracting the liquid hydrocarbons, and a brick-lined retort, 14 ft. high and 3½ ft. in diameter, in which the waste material is placed. As it is gradually carbonized, the circulating air becomes charged with gases, which lend their aid to the process. The temperature remains comparatively low.

DUAL TIRES FOR TRUCKS NOW HAVE NONSKID APPLIANCE

Those big solid-rubber tires with double tread for the rear wheels of motor trucks, now are provided with a special nonskid appliance of their own. It consists of a heavy chain which encircles the groove between the two treads of the tire, and which has iron crossbars at intervals, whose round ends rest on the faces of the tire. The crossbars have a diagonal movement which effectually prevents skidding, and the creeping of the chain in the groove reduces wear. The chain is tightened with a turnbuckle. The device is made in standard sizes for all trucks.



Antiskid Chain for Double Truck Tires: The Chain Rests between the Tire Treads, and the Iron Shoes Lie across Them

PUBLIC-PARK BOAT LANDINGS BLEND WITH SCENERY

Without marring the natural beauty of several small lakes in a San Francisco public park, practical boat landings of an unusual sort were constructed along their shores under the direction of municipal officials. Small rocky capes projecting into the water were used as foundations. Level concrete walks were built on top of these, and in cases where the stones were too widely separated, the same material was molded into artificial bowlders, which were placed in the interstices. Boats can be fastened to the sides of the landings by tying them to steel rings set in the concrete.

Nature Laid the Foundation of This Novel Boat Landing, One of Several in a San Francisco Park, and Man Completed the Task with Concrete. The Result Is Both Practical and Beautiful

PHYSIOLOGICAL EFFECT FOUND IN EARTH'S MAGNETISM

Knowing smiles generally greet any statement that one sleeps better, or worse, with the head toward some particular point of the compass. Yet even this supposed superstition may be founded on scientific fact; for a French physician finds now that certain reflexes in the human body, and the effects of percussion on some organs, are markedly stronger when the patient faces west. That the earth's magnetism has a definite physiological effect appears to be verified by other scientific observations.

¶ Previously sold only to banks and other business concerns employing messengers for the dispatch of valuables, "hold-up" insurance is now offered by several companies to the general public.

COLLEGE AND FACTORY JOIN TO TEACH ENGINEERING

Of great practical importance is a new course in electrical engineering made possible by the coöperation of a large eastern university and one of the great electrical manufacturing establishments. Five years are required to complete the study. The first two years are similar in arrangement to the present course, but the next two are altered to allow a considerable amount of work at the factory, where about half the student's time will be spent. The last year is practically of a post-graduate nature, devoted to research, design, project, and administration. The object is to fit graduates for positions as managers and superintendents. The degree of master of science is conferred on graduation.

FARMER PICKS UP POTATOES WITH WOODEN TONGS

Daylong stooping and nightlong backache are largely eliminated from potato harvesting by use of the little farm implement illustrated. Closer inspection shows it to be wooden tongs, with arms held apart by a weak coil spring. The lower end of each arm is split and backed with straps, to provide a socket in which the potato is grasped and conveyed to the basket.

¶ Use of 20 airplanes to "shoo" wild ducks away from the rice fields of the Pacific coast, is a project seriously contemplated by the growers' association of that region.

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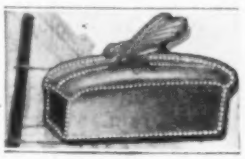
German Automobile, Designed in the Form of a Whale, Exhibited at the Leipzig Fair: It will be Seen That the Body, for All Its Realistic Shape, is Mounted on a Chassis of Standard Form

GROTESQUE GERMAN DESIGN MAKES AUTO LIKE WHALE

German fondness for grotesquery, usually held within limits, often finds extreme expression at exhibition times. One of the features of Leipzig's fall fair last year was an auto designed to resemble a whale, and the builders achieved a work of considerable realism. The driver of the queer car, emulating Jonah, looks out from between the opened jaws of the counterfeit cetacean.

HOUSEFLY ON LOAF OF BREAD ADVERTISES BAKERY

Almost startling to the professional advertiser in its defiance of advertising theory is a large electric sign that bears the name of a bakery company. Playing on the last syllable of his name, the former owner, in designing the sign, placed a large housefly on top a loaf of bread, and caused the whole to be illuminated at night by scores of electric bulbs. Criticism was general at first, as was probably expected, but the baker knew it was good advertising; and so the sign remains.



WORKERS TIED WITH ROPES TO MINE'S STEEP SIDES

The occupation of the mine worker is always a strange one to the man on the surface, and the operation known as "milling" iron ore is perhaps least familiar of all. This is the system used where the ore is soft enough to be dislodged by hand labor, and to fall to the bottom of the "mill hole," a steep-sided, conical pit with a tunnel or drift at the bottom. The miners work around the sides of the hole, breaking off fragments which drop into cars in the drift below. To guard against slipping, they are tied to the bank by short ropes around their waists. A long rope, suspended from the top, enables them, at quitting time, to walk calmly up the almost vertical surface and over the top in safety.

PRESS FOR SORGHUM MOLASSES MADE FROM OLD WRINGER

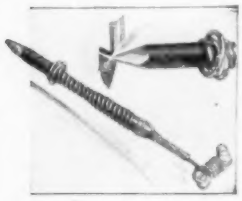
After growing a fine patch of sorghum cane near his home, an Ohio suburbanite found he could not get it to any mill,

Homemade Sorghum-Molasses Press: The Cane is Crushed by the Big Rollers at the Left, and the Pulp Then Run through the Old Clothes Wringer at the Right

and would have to work it himself or waste it. So he made a mill of his own, using a few planks, a pair of four-inch rollers with two handles, and an old clothes wringer. With two galvanized tubs to catch the juice, the cane stalks were passed first through the wood rollers. Then the crushed pulp was put through the wringer. As a result, after cooking the juice in a wash boiler, the ingenious cane grower realized 12 gal. of sorghum molasses.

ELECTRIC SOLDERING IRON FOR AUTOMOBILE OWNER

An electric soldering iron may now be had in such simple form that it particularly appeals to automobile owners. The iron proper is surrounded by a coil grip that safeguards the hand of the user. Several yards of wire, with attachment, permit current to be drawn from any convenient source. The iron is hot, of course, a few minutes after the current is turned on, and stays hot until the job is finished.



ANCHOR SHIFTING SAND DUNES WITH TREES AND GRASS

In the winter gales that sweep down the Massachusetts coast, the sand dunes of the Cape Cod region shift about with little regard for either geographical lines or the works of man. It is the unremitting task of the state foresters to strengthen these fickle ramparts against the sea's invasions. Hardy native grasses, or such tenacious foreigners as Scotch broom, are planted in a veritable carpet over the inconstant mounds. When they have taken root, young pines, either the Norway or a local species, are set into the loose soil; but first they are grown to a height of some six inches in good turf, and a generous quantity of it is transplanted with them. Four years or so, if fire does not destroy the work, find the dunes firmly knit together, and cured of their wanderlust.

AIR PHOTOGRAPHS HAVE POWER TO FIND LOST CITIES

The remarkable discovery, through the medium of lines on an aerial photograph, of a lost city buried near Samaria, in the valley of the Tigris River, suggests a vast field of exploration for the airplane camera. Though its population must have been enormous, no trace of the ancient Turkish city's walls and gardens is visible to an observer on the ground. Archæologists know the advantage of even a slight elevation in tracing the faint indices of an obliterated civilization, wholly concealed at their own level by the overgrowth of vegetation. These phantoms of the past, however, readily record their outlines on the photographic emulsion.

Japan is about to enter upon an ambitious naval construction program. Within the next eight years four 40,000-ton battleships, four battle cruisers, 20 light cruisers, 80 destroyers, 70 submarines, and 30 other ships are to be built at a cost of eight hundred and twenty-four million dollars.

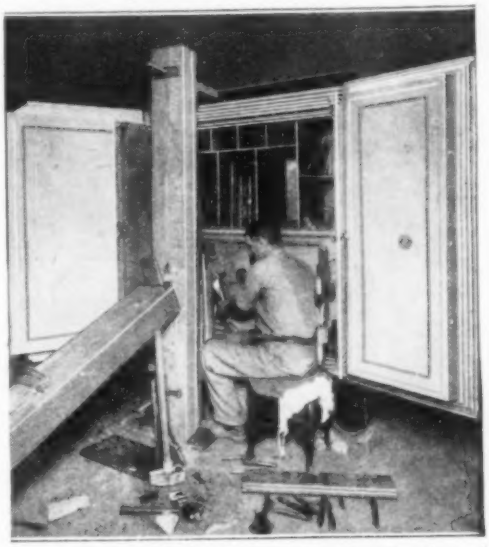
In These Big Semiportal-Type Cranes, the Single Leg of the Bridge Runs on a Rail on the Wharf, While Another Rail, Supported by Brackets on the Building, Accommodates the Trucks of the Inner End. The Operating Cab Rotates on the Bridge

FOUR BIG CRANES INSTALLED AT ARMY SUPPLY BASE

Four big hoist cranes of unusual type have just been installed on the docks of the U. S. Army supply base at Boston. They are of semiportal bridge form, the single leg of the bridge running on a rail along the wharf, while another rail, mounted on brackets on the side of the wharf shed, supports the other end of the bridge. The carriage turns on a circular track on the bridge, with a hollow pivot through which the electrical conductors enter the cab. The whole crane may thus be moved along the wharf, the cab may be rotated, or a straight hoist may be made with either the boom or the cable. The crane will handle 5,000 lb. in a 52-ft. radius, with an overload capacity of 8,000 lb., at a speed of 250 ft. a minute.

LOOSE SCREW JAMS LOCKING GEAR IN CITY SAFE

It was only a little screw in a safe belonging to the city treasurer of Cincinnati; but when it worked loose at quitting time on a recent Thursday evening it wedged itself into a most strategic position. On Friday morning the paymaster asked for the $25,000 with which to pay off hundreds of city employes, many of them already in line for their money. But the screw demurred; and the safe stayed shut. By Friday afternoon every amateur safe cracker in the office had tried and failed to open it. In despair, the com-

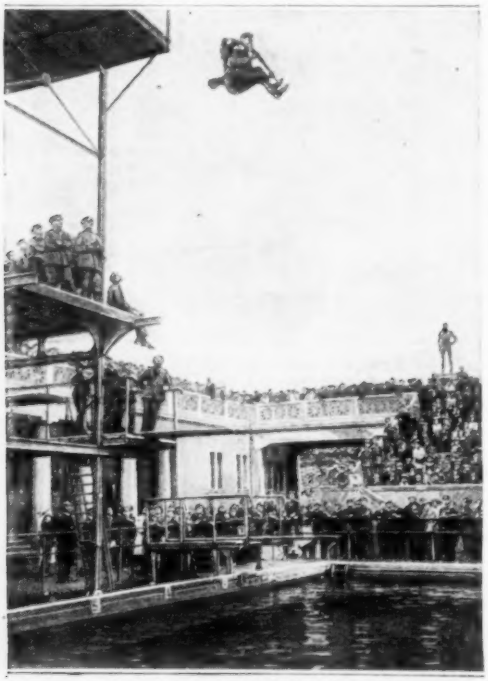


Days of Effort were Required for the Opening of This Safe, When a Small Screw Jarred Loose and Jammed the Locking Mechanism

mand was given to drill it open. A crew of four experts from the safe company worked Friday, Saturday, Sunday, and Monday—and on Tuesday morning finally moved the bars and swung the door.

GERMAN SOLDIER TAKES HIGH DIVE IN MARCHING EQUIPMENT

On a program of drills and sports recently given by the German soldiery at



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This Daring High Dive by a Soldier in Full Marching Equipment Was the Most Thrilling Feature of a Recent Field Day, Held in the Stadium at Berlin, Germany

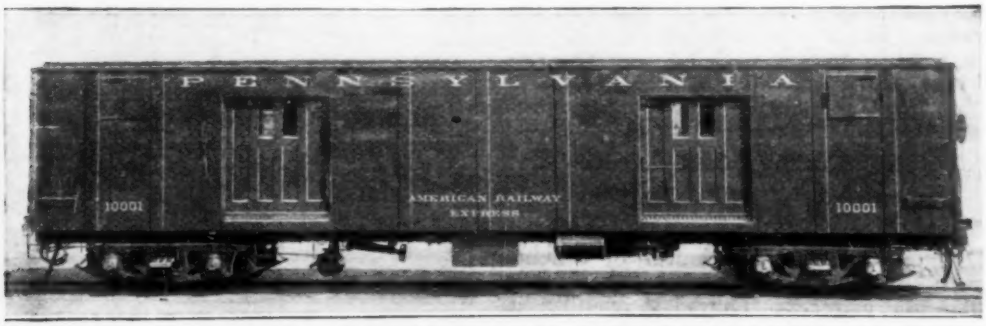
the Stadium in Berlin, was one item that stood out above the others, though many required no little daring and skill. Dressed in full marching equipment, with heavy pack on his back, hobnailed shoes on his feet, and bayoneted rifle in his hands, a soldier climbed slowly up, and up, to the high-dive platform, a good 50 ft. above the swimming pool. While the crowd held its breath, he leaped feet first, sank far beneath the surface, but finally rose, gained the side, and was pulled from the water.

POSTCARDS FIX AUTO TIRE IN SERBIAN WILDS

Common things often find strange uses in emergency, but it remained for a Serbian Red Cross chauffeur to repair an auto with a pack of souvenir postcards. On an almost impassable mountain road between Mitrovitza and Kralievo, 300 miles from a repair shop and 60 from a telegraph office, an old inner tube, covered with patches and old leather and sacking, finally gave out altogether. The cards, left in the car by accident, were inserted between the tube and the casing, and saved the day.

EXPRESS CAR FOR PASSENGER OR FREIGHT-TRAIN USE

The shortage of express facilities has been much relieved by the introduction of a new type of express car by an eastern railroad. The design enables the car to be used in either freight or passenger trains without incongruous effect. Though of general box-car shape, it has doors at the ends and two at each side; is of steel construction, and is ventilated, heated, and electric-lighted. It is 50 ft. 6¾ in. long inside, with a capacity of 70,000 lb., and is adaptable to parcel post, mail storage, or baggage use.



Steel Express Car of Box-Car Shape, Appropriate for Use in Either Freight or Passenger Trains: It Has Six Doors, a Ventilating System, and is Heated and Electric-Lighted. Its Capacity Is 70,000 Pounds

The Declaration Chamber of Independence Hall, Restored by Modern Craftsmen to Its Original Condition: The Large Painting at the Left Is of Washington, by Peale

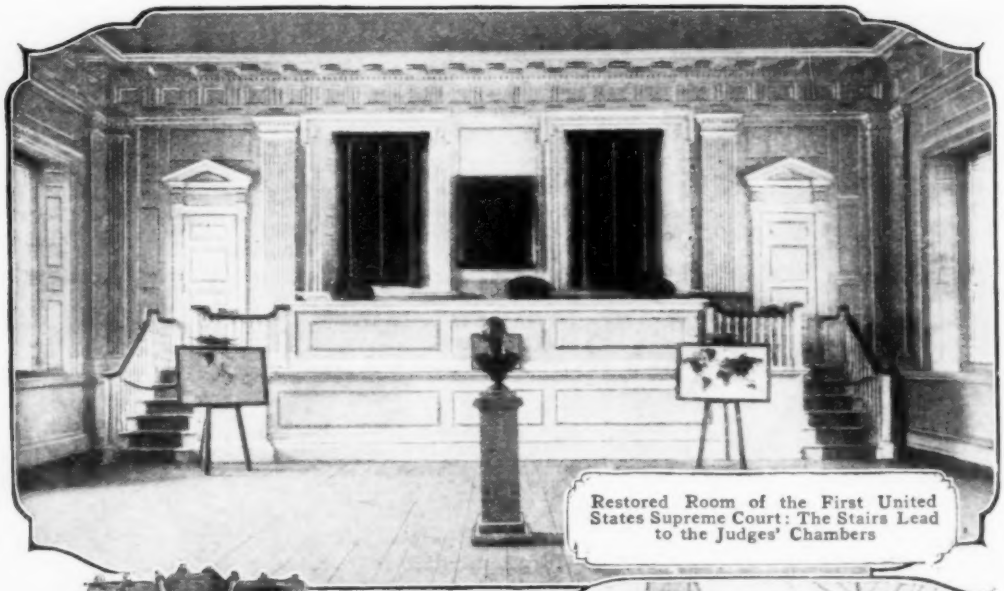
THE REJUVENATION OF INDEPENDENCE HALL

By JOHN F. McCLARREN

AMERICA'S most famous historical monuments, Independence Hall and Congress Hall, are young again. Painstaking treatment by specialists in architectural and structural infirmity has enabled Philadelphia's ancient meeting houses to throw off the weight of years, and reappear in not only the habiliments but the restored strength of youth. And with such reverent regard for the details of sacred sentiment has the work been done, that only in the elements of essential soundness have the old buildings been modernized. In all their refreshed appointments, they are still of the 18th century, just as they were designed, to a perfect colonial model, in the 1730's. In that day, the most pretentious examples of the order, they are even now among the finest exponents of the pure colonial style.

Grand Stairway from the Lobby of the Hall to the Second Floor: The Small Stair at the Right Above Leads to the Balcony, and into the Belfry Where the Liberty Bell Originally Hung

No detail in the work of restoration was too small for careful consideration. Even so commonplace a task as reshingling the roof was deferred until a study of the old records disclosed the kind of shingles



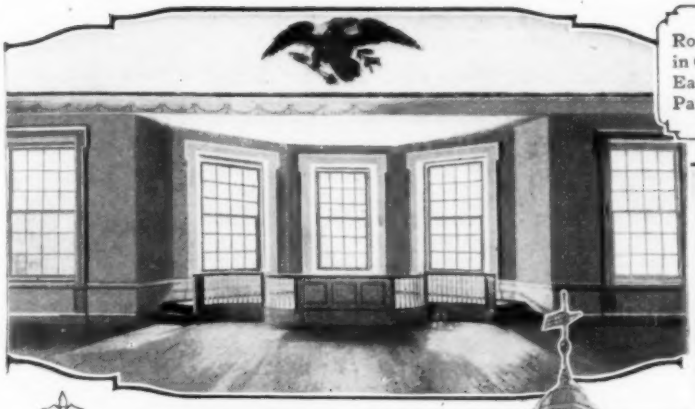
Restored Room of the First United States Supreme Court: The Stairs Lead to the Judges' Chambers

The Liberty Bell Itself—about the Only Thing in Independence Hall That was Not Restored: The Old Crack Is Still There

The Cobblestone Driveway, Back to Its Original Condition, Still Bordered by Colonial Poles and Chains on the Coping of the Walls

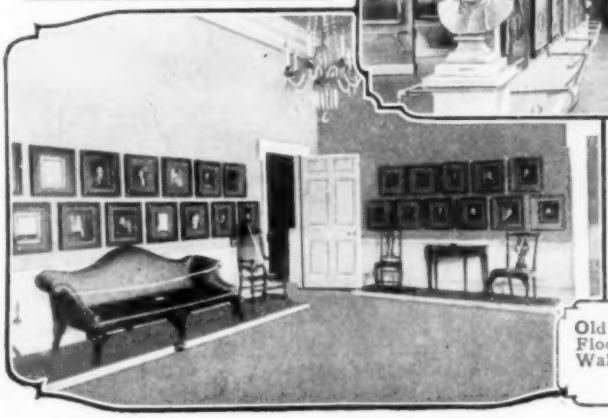
Independence Hall Restored: Not a Detail of Its Construction has been Overlooked in the Work of Rejuvenating the Old Structure, Which, Inside and Out, has Simply been Strengthened and Repaired, without being Modernized. Even the Shingles Are Just Like Those Put On Originally

Colonial Street Lamp of Revolutionary Days, Which, Repaired and Made New, Still Does Duty outside the Ancient Hall



Rostrum in the Old Senate Chamber in Congress Hall: The Emblematic Eagle at the Top of the Picture is Painted on the Ceiling of the Room

Congress Hall, Which Shared in the Restoration Work Done on Its Neighbor, Independence Hall, was Just as Carefully Preserved in Its Original State



First Floor of Congress Hall, Used by the House from 1790 to 1800: The Gallery at the Rear Holds the Original Thirteen State Flags

Old Senate Committee Room on the Second Floor of Congress Hall: The Pastels on the Wall and the Furniture Are of the Revolutionary Period

originally used, and enabled the selection of their exact counterparts. And so throughout the buildings. Not a nook or corner, a window frame or sash, a doorway or stair, but has been faithfully returned to its initial form.

The exterior appointments have received attention no less careful than that bestowed upon the interior. The old-fashioned lamps which originally furnished illumination about the structures are again in their places and the old cobblestone driveway, with its side poles and chain, is ready for further service. The restoration of the driveway, over which passed the conveyances of so many celebrities of the time, is especially well done.

While Independence Hall abounds in beautiful examples of colonial design and architecture, there are specimens in Congress Hall that many consider even more attractive. The great doors, with their old-fashioned locks and great, long hinges, opening into the hallway from which leads a colonial stairway of the first type, are features of the restoration. It was in Congress Hall that congress sat from 1790 to 1800, and there President Washington was inaugurated for his second term of office. The original construction of the galleries and rostrums in the senate chamber and in the "house" has been very well brought out in the restoration.

Of course, Independence Hall came into existence without any thought of the part it was destined to play in the birth of the nation. Necessity really created it. It appears, from documents well authenticated, that the Provincial Assembly of Pennsylvania had been meeting in a house, annually rented in Philadelphia, until May 1, 1729. It was shortly after this date that the assembly voted £2,000 toward the purchase of ground for the building and its construction. It was designed by Andrew Hamilton, a barrister of Philadelphia, who, in making his plans, provided for two wings, one of them Congress Hall. In 1732 ground for the building was broken, but the construction dragged on for some years before the work was finished, although certain rooms were used for some years before the whole was completed.

Construction of Congress Hall began in 1787, and was completed in 1789, and the remaining wing of Independence Hall, known as "City Hall," was started in 1789 and finished in 1791.

BAKER MODELS PRESIDENT IN ALMOND PASTE

A life-size bust of President Wilson and a replica of a book containing the well-known "Fourteen Points" are the recent creations of an employe in a catering establishment. Almond paste is the material used, and with a success that is evidenced by the photograph. Both have been presented to the president.

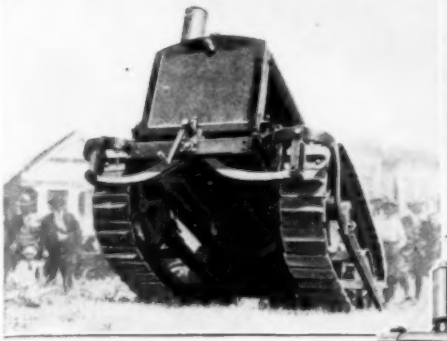
Using Almond Paste as His Medium, This Employe of a Catering Company Modeled the Bust of Wilson and the Book Containing the "Fourteen Points"

ELECTRIC-SHOCK PHYSIOLOGY BETTER KNOWN SINCE WAR

Study of cases of electric shock caused by contact with the 1,000-volt wires used in war defenses has brought some curious facts to light. It is found that the men were little harmed by shocks they expected, but surprise shocks frequently were fatal. Subsequent experiments with animals proved the soundness of this conclusion. In many instances, however, the victim is only apparently dead, and may be resuscitated by prompt use of artificial respiration.

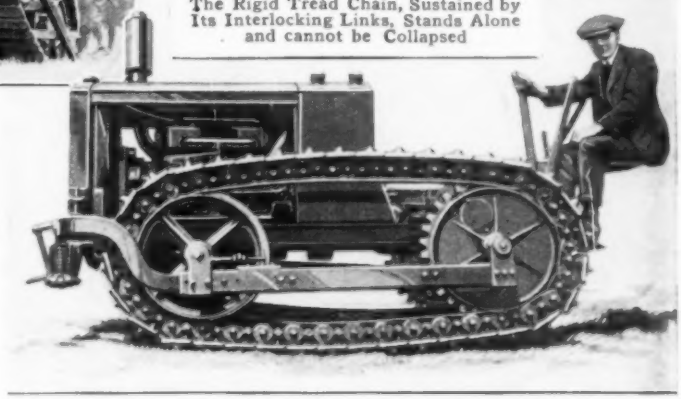
RIGID CHAIN TREAD SUPPORTS TRACTOR WITHOUT IDLERS

An endless-tread chain for tractors, so rigid that it supports the machine without any idler wheels between the front and rear sprockets, has just been brought out by a California manufacturer. The chain is so designed that its heavy links



In Surmounting a Ridge of Land, the Whole Weight of the Tractor is Carried by the Unsupported Central Part of the Heavy Chain Tread

The Rigid Tread Chain, Sustained by Its Interlocking Links, Stands Alone and cannot be Collapsed

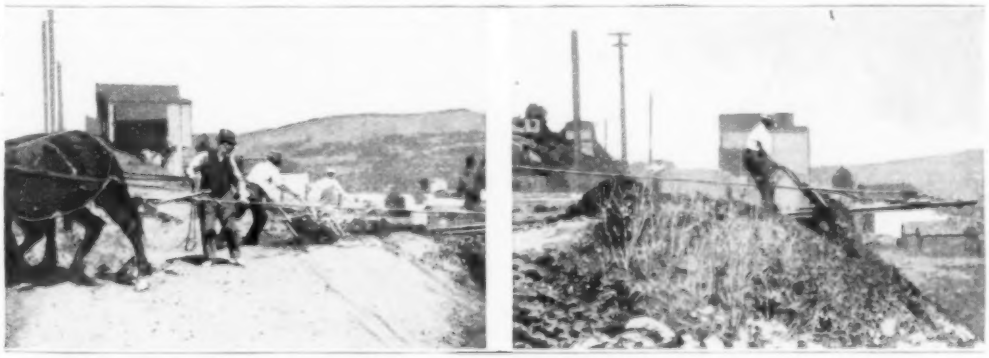


Broadside View, Showing That No Idler Sprockets are Used, the Chain Tread Contacting with the Ground at All Points

interlock, with all pressure and pivot surfaces exceptionally large, and with flexing movement possible only within the limits needed for encircling the wheels. The whole weight of the tractor is easily supported by the free intermediate portion of the chain, and the inventor claims the upper face, without supports, would withstand a downward pressure of 20 tons. A uniform distribution of the tractor load is one of the advantages of the new tread.

RAILS, PULLEY, AND SCRAPER REPLACE SHOVELERS

In making a dirt fill not long ago, a contractor was able to do without the crew of shovelers usually employed, by substituting for them a rather ingenious scraping system. Projecting horizontally over the edge of the fill were placed two long iron rails which supported a single pulley block at their outer end. Through the block he passed a rope, one end of which was attached to a scraper, the other to the doubletree of a team. Then, as each wagon dumped its load, the scraper was moved by the team, and guided by a laborer into the load and over the rails, the loose earth falling between them. The rails are easily moved as the filling progresses along the hill.



By Using This Combination of Steel Rails, Pulley, and Scraper, a Contractor Was Able to Make This Fill Quickly. At the Left the Wooden Scraper has been Guided into a Freshly Dumped Load of Loose Earth. At the Right, the Team has Drawn the Scraper toward the Pulley, Causing the Load to Fall between the Rails

PORTABLE ELECTRIC BLOWER COOLS UNDERGROUND WIRES

When electric wires in underground conduits become even slightly heated, they are in danger, because the heat cannot escape and is likely to increase. A service company in a large Michigan city has a portable blowing outfit for such occasions,

Portable Electric Blower for Cooling Underground Wires: The Vent Pipe is Sealed into a Manhole, and Air Pumped through

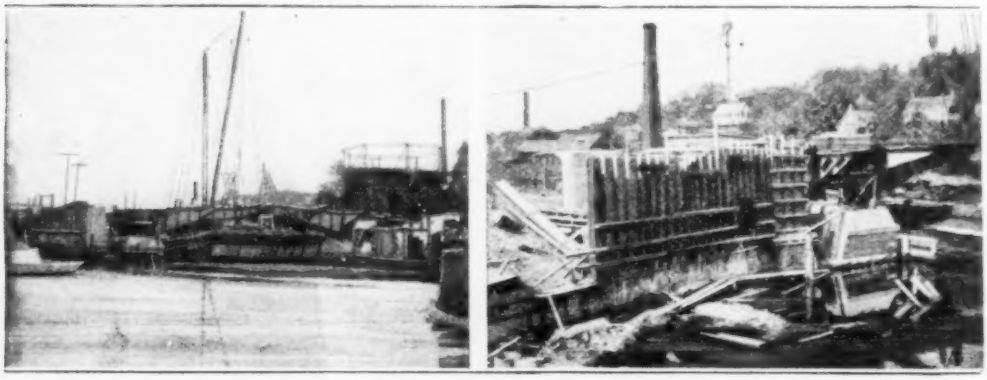
consisting of a 28-in. fan and a 7½-hp. motor housed in a little cabin on a steel trailer. When the conduit temperature anywhere reaches 150°, the pipe of the blower is sealed into a manhole opening at one end of the heated section, and a ventilating cover put on a manhole at the other end, and the wires are soon cooled.

STONES GATHERED FROM OCEAN BOTTOM BY DANISH BOATS

Operating off the coasts of Denmark and Sweden is a unique fleet of motorboats and sailing vessels, equipped for gathering stones from the bottom of the ocean to supply the first-named country with material for building harbor works. Each craft carries a diving outfit and a derrick for lifting the rocks on board. Bowlders weighing as much as eight tons are brought to the surface by the hoisting apparatus. Divers locate the stones and attach them to the derrick cable. Recently the boats have been forced to work in deep water at a considerable distance from shore, because the supply of stones in shallower water has been exhausted.

QUICKSANDS HAMPER BUILDING OF MASSACHUSETTS BRIDGE

Handsome as it is, there is general agreement that the new bridge over the Fore River between Weymouth and East Braintree, Mass., has cost more than it should, and that nature played a trick on the builders. Construction was started two years ago on a bridge of steel, cement, and granite, 200 ft. long and 50 ft. wide, with a 50-ft. draw. When the piers were sunk, however, they continued sinking, and disappeared from sight. So much time and money were consumed before the bottom of the quicksand finally was reached that one contractor and another dropped out, and the third is just finishing the job. The bridge is southern Massachusetts' direct route to Boston, but a temporary foot bridge has had to carry all the responsibility during construction.



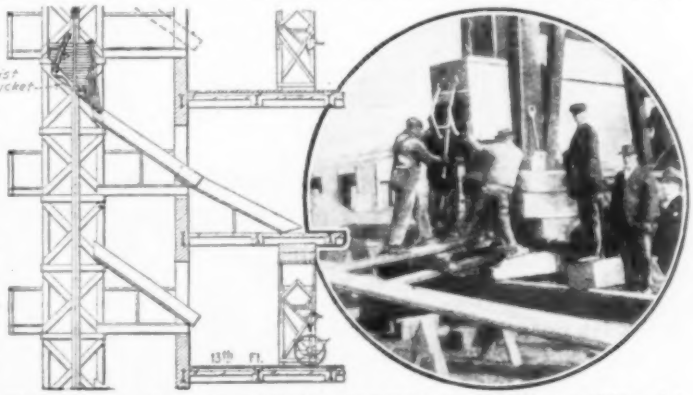
At the South Entrance, in the Left View, a Scow and Derrick are Seen Laying Girders for the New Bridge. The Right View Is of the North Entrance, Where the Cement, Stone, and Steel are being Put Together. It Is Here That the Quicksand Trouble Occurred

TEA PARTY INTERRUPTED BY RUNAWAY STREET CAR

A TEA party in Tulsa, Okla., was rudely interrupted not long ago, when a runaway interurban car left the track, tore over sidewalk and lawn, and buried itself in the dining-room window. Not a tea drinker was injured; and, stranger still, a young man asleep in the room above, slept on. Thus the incident ended as comedy, though the stage was set for tragedy. At the top of a hill, four blocks away, when the air brakes failed, passengers and crew had saved themselves by jumping. The deserted car transformed itself into a 30-ton projectile, roared past a group of waiting "fares," missed several autos by a hair's breadth, and shot tangentially from the right-angled turn at the bottom, with the results described.

BUCKET WITH BOTTOM DOOR SPEEDS CONCRETE WORK

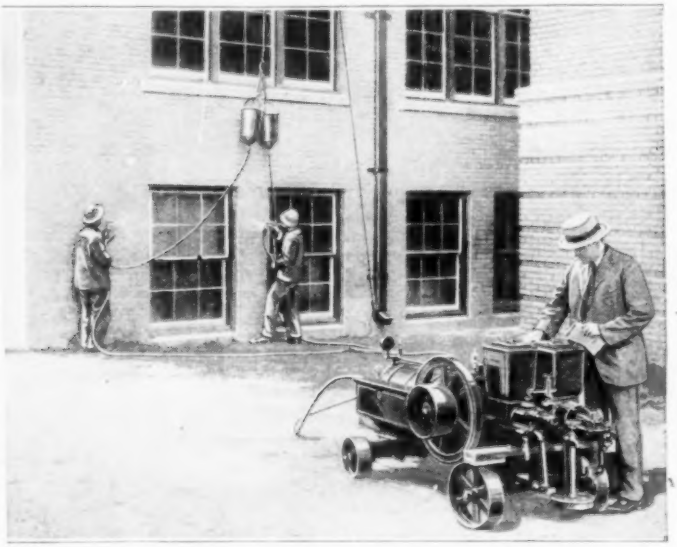
Handling of concrete, both in building construction and pile making, is greatly facilitated and reduced in cost by new forms of hoisting buckets that dump through a door in the bottom. In pile-driving work, a bucket, 36 in. high and 30 in. square at the top, reduced to 12 by 18 in. at the bottom, is used. It is loaded from wheelbarrows, and hoisted to the top of the driven pile casing by a 1½-in. manila rope from the engine. Two men guide the hanging bucket with ropes, and a third opens the well-balanced and easily sliding door, discharging ¾ cu. yd. of concrete. In building work, the bucket is shaped to dump its contents to one side, into a chute projecting from a window, and has a skip section which closes the gap to the end of the chute before the door opens. The door mechanism is so designed that it will not clog or stick, and even in cold weather the buckets may be kept filled with little danger of freezing.



The Diagram at the Left Clearly Indicates the Method of Using the Bottom-Door Bucket in Building Work, the Door being Tripped at the Chute. At the Right is Seen the Square Bucket Whose Bottom Door Makes Piling Work Easier

WALLS EVENLY WATERPROOFED WITH PNEUMATIC SPRAY

To waterproof structural iron, warehouse walls, and similar large surfaces, a pneumatic paint-spraying outfit will eventually pay for itself in paint and wages saved. The pasty waterproofing compound is suspended in a pail above the surface to be sprayed, and led through a hose to the air gun. Air from a portable compressor is likewise led to the gun, with the result that every particle of the compound is thoroughly atomized. The coating is uniform and penetrates into every hole and crevice. To insure regular flow from the pail, it is maintained by a rope and pulley at a constant height above the work.



A Large Brick School Building is Here being Coated with a Waterproofing Compound. Air from the Portable Compressor at the Right Mingles with the Compound from the Suspended Pails to Produce a Spray That Penetrates into Every Hole and Crevice

PROPOSES USE OF TRACTORS TO CLEAR ROADS OF SNOW

The increasing importance of motor-truck transportation makes valuable any practical suggestion for keeping the highways open in winter. A French tank officer has proposed the use of crawl-tread tractors for hauling snowplows, their immense power making their effectiveness certain. A special form of tread would probably be necessary, and it might be desirable to push the plow instead of pulling it.

SYNTHETIC CAST IRON MADE FROM STEEL TURNINGS

Synthetic cast iron was manufactured in France on so large a scale as a war product that efforts are now being made to place the process on a commercial basis. Economy of production is the chief consideration, as the steel turnings, and similar scrap from which the metal is produced, have little value for other purposes. The turnings are mixed with carbon in an electric furnace, and cementation begins in the upper part of the charge at about 1,200° F. At fusion, the metal is completely carburized, and is cast at 2,190° to 2,370° F. The furnace takes large currents at lower voltages than usual, and the resistance of the charge is increased by introducing basic slag. This also removes the sulphur from the iron, and a process has been found for extracting the phosphorus, making a metal of great purity, whose composition is accurately controlled by the mixture. The use of hydroelectric power for the furnaces is thought to solve the economic problem.

WEIGHTS ON CATTLE HORNS TO CHANGE THEIR SHAPE

An English inventor undertakes to change the shape of the horns of cattle by hanging weights on them while they are growing. The weights are pear-shaped, with a tapered hole lengthwise to fit the horn, and are held in place by setscrews. Heavier weights are used as the horns grow larger. Their shape prevents the cattle from scraping them off against trees or fences.

CAMEL TEAM AND AUTO SERVE AUSTRALIAN TOWN

Tibooburra in Panorama: Farthest Inland of All Towns in New South Wales, Australia, and 210 Miles by Road from the Nearest Railway, at Broken Hill. It Is an Old Mining Center, and is Surrounded by Good Grazing Country

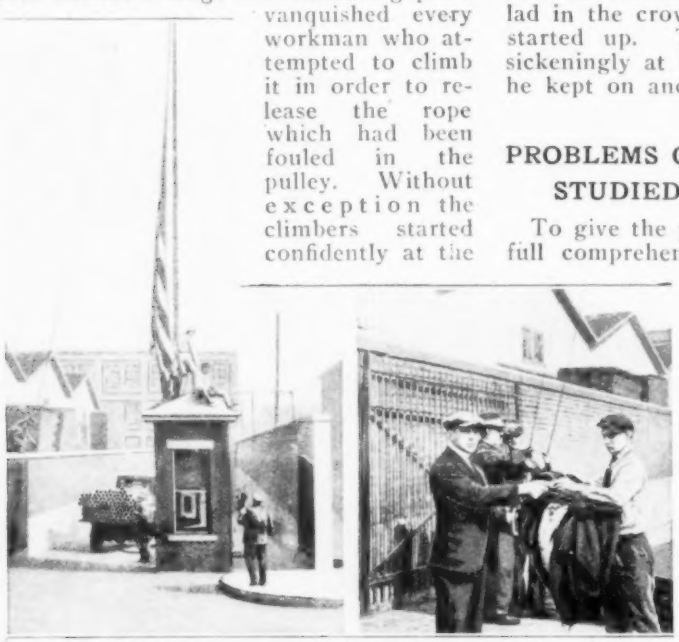
One Way of Transporting Merchandise over the 210-Mile Route from Broken Hill to Tibooburra Is by Camel Train like That Above. At the Right Is the Mail Car, Which Makes Two Trips a Week. The Hill of Drifted Sand, Almost Perpendicular toward the Prevailing Winds, Is a Feature of the Local Landscapes

Much Wool is Raised around Tibooburra, and the Way the Growers Send It to Market Is by Means of Huge Wagons Drawn by Oxen. There Are 18 of the Animals in the Team Seen Coming into the Foreground, on Their Way to Broken Hill, the Nearest Trading Center

Australia's big cities and active industries make it difficult to realize that the island continent is settled only on its outer fringe, and the interior is still unconquered wilderness. Some of the mining settlements, however, are quite a ways inland. The town of Tibooburra, for example, in the northwest corner of New South Wales, is 210 miles from Broken Hill, the nearest railroad point. The mail comes in twice a week, by motor car, over roads banked by drifted sand hills, where the annual rainfall is only 3 to 8 in. Camel teams furnish the only freight service, and wool grown in the district is transported to market on big oxen-drawn wagons.

FLAG RESCUED FROM SWAYING POLE BY DARING CLIMBER

For two days a needlelike steel flagpole outside a large manufacturing plant vanquished every workman who attempted to climb it in order to release the rope which had been fouled in the pulley. Without exception the climbers started confidently at the bottom, where the pole is 6 in. wide; but every man turned back on nearing the top where it narrows to 1¼ in. One of the men finally wagered five dollars that the feat was impossible. Hearing this, a lad in the crowd took off his shoes and started up. The slender pole swayed sickeningly at the top of his ascent, but he kept on and reached his goal.



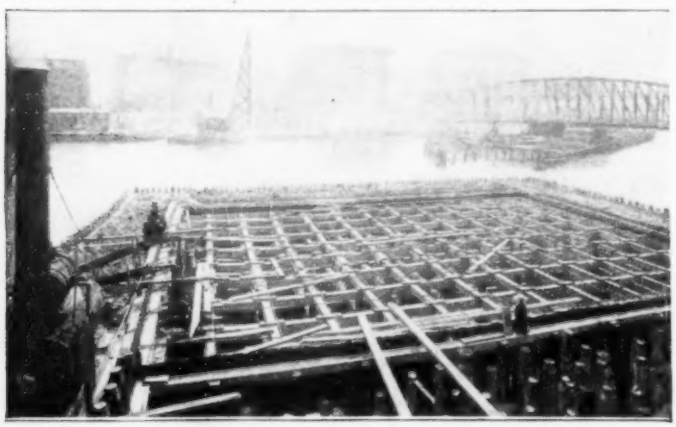
The Boy Who Rescued the Flag is Sitting on Top of the Cabin at the Base of the Steel Flagpole, Which He has Just Descended, as Seen in the Left-Hand Picture. At the Right He is Delivering the Flag and Accepting the Five Dollar Reward

PROBLEMS OF RECONSTRUCTION STUDIED IN MOVIE FILMS

To give the people of New York State full comprehension of the problems of reconstruction, motion pictures on vital topics are being exhibited by a state commission in communities of all sizes. A motor-truck theater makes the campaign independent of local conditions and facilities. Problems of freight traffic, public health, Americanization, employment, and housing are among those pictorially considered by the traveling show. A powerful talking machine, with a range of 200 yd., is used to present speeches.

BUILD ENORMOUS COFFERDAM FOR CHICAGO BRIDGE

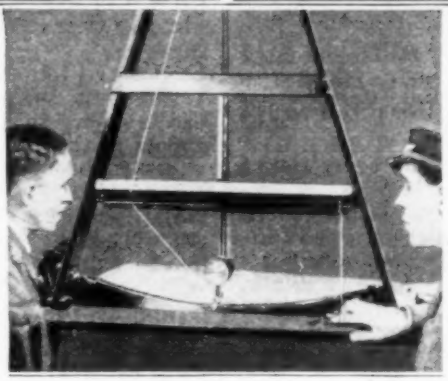
Setting the big concrete tail pits for the double-decked bascule bridge that is soon to grace Chicago's new boulevard link necessitated the construction of two colossal cofferdams in the Chicago River. The one at the north bridgehead, in water 22 ft. deep, measured 105 by 75 ft. inside the walls, with its base 34½ ft. below water level. The outer wall was made of wood sheeting, 32 ft. deep, on 45-ft. piling, the inner wall being of steel sheeting, 45 ft. deep. Five huge sets of braces, a little smaller than the inside of the cofferdam, were sunk in place before the water was pumped out. When the wall space was built up with clay, the sheet steel was forced inward so that a tight joint with the bracing was formed.



Huge Cofferdam at the North Pier of Chicago's New Boulevard Bridge: The Inner Wall Is of Steel Sheeting; the Outer, of Piling Filled with Clay

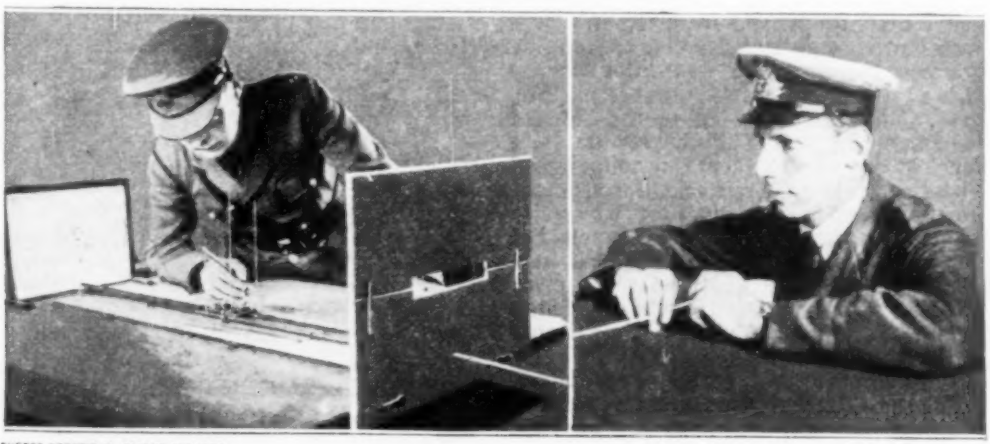
SIMPLE TESTS WEED UNFIT FROM BRITISH AIR SERVICE

The Interesting Instruments Illustrated on This Page are All Used by the Medical Staff of the British Air Service in Testing Airmen for Flying Fitness, with Emphasis on the Condition of Lungs, Eyes, and Nerves. The Simple, Mercury-Filled U-Tube Above Serves Several Purposes. Blowing Up and Holding the Mercury Column as High as Possible, the Airman Reveals to the Examiner Not Only His Resolution, or Pluck, but His Nervous Stability, the Tone of the Abdominal Wall, and His Ability to Resist Fatigue. The Medical Officer Tabulates Each Result



The Conditions Indicated by the More Complicated Apparatus Above are Linked with Those Revealed by the Simpler Tube on the Left. Like the Latter, It Is Valuable in Detecting the Respiratory Fatigue Which So Quickly Overtakes Defective Lungs at High Altitudes. It Goes Further, However, in Recording the Lung Capacity against Resistance. One Other Test, Not Illustrated, is Made with a Modified Gas Meter for the Purpose of Measuring Simple Lung Capacity. Both This and the Two Tests Above Bear Witness to the Importance Attached to Healthy Respiratory Equipment

The Little Disk on the Pendulum Above is Held at the Left of the Horizontal Time Scale. When the Pendulum Falls, Bearing with It a Strong String Stretched from Disk to Pivot, the Disk Changes Color. At the Instant He Observes the Color Change, the Subject Presses the Key, Thus Arresting the String, and Registering His Quickness of Coördination between Perception and Action



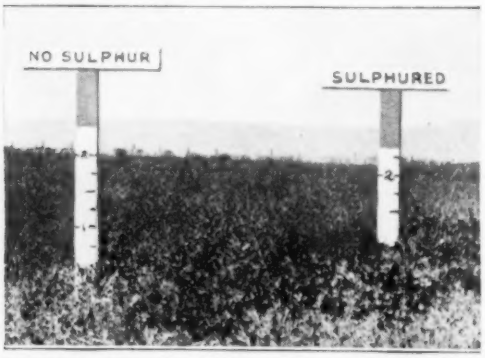
PHOTOS COPYRIGHT, CLARKE AND HYDE

These Lower Photographs Illustrate a Test for Judgment of Distance, Carried Out in a Room Lighted Only by the Opal Plate at the Left. This Plate Silhouettes the Three Upright Pins, Two Fixed, and One Movable, Which are Seen near the Examiner's Right Hand. Peering through the Horizontal Slit, the Airman Manipulates a 20-Foot String Until He Believes the Pins to Be in Line. Accuracy in This Test Implies an Ability to Land an Airplane Accurately

SULPHUR AS A FERTILIZER

By ROBERT H. MOULTON

PRACTICALLY all of Oregon east of the Cascades is essentially a live-stock country, the principal features of ranch operations being dairying, sheep raising, and beef production. Feed for the live stock is the biggest problem in the way



The Scales Ruled on the Signposts, the Figures Signifying Feet, Indicate the Superior Growth of the Sulphured Alfalfa, as Compared with That Not So Treated

of increased production, and every ton of hay which can be raised is a potent factor in bringing prosperity. When ranchers in several districts in eastern and central Oregon found that one dollar expended for sulphur and applied to alfalfa land was returning $20 in increased yield, they jumped right into the saddle, and are now using it by the carload.

While sulphur has been used to a certain extent as a spray in combating insect pests in fruit farming, its value as a fertilizer has been practically unknown until quite recently. The figures indicated above are not derived from experimental tests, but were obtained under thoroughly practical conditions in Deschutes County on 250 irrigated alfalfa ranches. Here, the sulphur was applied at the rate of 100 lb. to the acre, and the results were checked by the farmers in coöperation with the state college agricultural-extension workers. The 1919 crop of alfalfa from 3,000 acres so treated indicates that 3,000 additional tons of hay were harvested, which, at the central Oregon price of $20 a ton, means $60,000 in additional wealth. In no case did the original cost of the sulphur, and the expense of hauling and application, exceed three dollars.

For the past two years, the Oregon experiment station has been testing the effects of various fertilizers, and, following the discovery, a year or so ago, that sulphur on certain soils would increase the yield of alfalfa from 10 to 100 per cent, very careful attention has been given to this element. The first test was made during the summer of 1918, a 10-lb. sample of sulphur being applied to approximately one-tenth of an acre, when the second cutting was about 8 in. high. The result of such a limited experiment, could, of course, not be considered conclusive, but there was a decided improvement in the height and color of the alfalfa on the sulphured area. Later, an entire field, with the exception of a check plot for obtaining a comparison, was treated with flowers of sulphur, 500 lb. being used at the rate of 100 lb. to the acre. Owing to a drought during the late summer, only meager results could be noticed, but in the spring of 1919 the difference in growth in the sulphured and unsulphured plots at once became apparent, and during the past season the difference has been very pronounced.

The first cutting of that season was carefully weighed and checked by field agents of the Oregon experiment station, and disclosed the fact that the sulphured area yielded 7,430 lb. to the acre, 2,555 lb. more than the untreated plot, and the second cutting showed 1,900 lb. in favor of the sulphured area, making the total additional yield 4,455 lb., or, in this instance, approximately two tons more per acre.

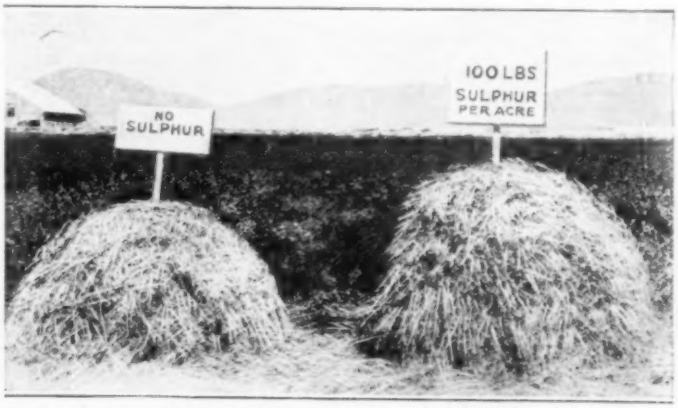
On one ranch, in Klamath County, similar results were observed, although here, owing to adverse weather conditions and early cutting of the second crop, the average surplus yield of treated land amounted to only one ton per acre. On

The Scissors-and-Beam Method Used in Weighing the Crop in the Field for the Accurate Checking of Results

another ranch, a 30-ft. strip was cut through the entire field and the hay raked and shocked in the usual manner. The

shocks were cured and weighed, and the areas of sulphured and unsulphured plots computed. The strip cut was a fair average of the entire field, and the yields were figured on the acreage basis. Results of the first cutting are not available, but the second cutting yielded 1,560 lb. more per acre on the sulphured area.

The soil of vast areas of ranch land throughout the West, including Washington, Idaho, Nevada, Utah, and California, are known to be similar to that of the districts in Oregon which responded so well to the sulphur treatment, and an expansion of its use to these various sections seems advisable and promising. Further experiments are expected to reveal the value of sulphur with other crops.



The Rick at the Left, As the Sign Indicates, Represents the Unsulphured Crop, Which Ran 3,300 Pounds to the Acre on Second Cutting. The Sulphur-Fertilized Crop Represented by the Right-Hand Pile Reached a Figure of 4,860 Pounds to the Acre

SILVERED-GLASS UTENSILS REPLACE PLATINUM

Among the many interesting substitutions to which Germany's extremity drove her industries, was the use of silvered-glass utensils in the chemical arts, in place of the customary platinum. In processes of electrolytical analysis, a platinum container, weighing an ounce or more, serves as the negative electrode. When such quantities of platinum became unavailable, glass dishes were roughened on the inside by sand blast, cleaned with chromic acid, and then coated with deposited silver by the mirror process. Ammoniacal silver-nitrate solution was used, reduced with formalin 40-per-cent solution. A silver deposit of one-half to three-fourths of a grain was formed in three to four minutes at a temperature not exceeding 86° F. When fitted with a thin platinum contact strip, clamped on the edge, these utensils served their purpose quite satisfactorily. They are, of course, a great deal less expensive than those made of platinum, even when that scarce metal can be obtained.

NO HOLES, BUCKLES, OR LOOPS IN FRICTIONLESS HARNESS

Based on the principle that a strap is no stronger than its weakest point, a new form of harness is made without buckles, holes, snaps, or loops. Of the 168 metal parts, 102 are made of aluminum and manganese bronze, the rest being rustproofed material. Surprising claims of longevity are made for this construction, 35 to 50 years being the estimate for ordi-

The Buckleless, Holeless, Snapless, Loopless Harness on This Team of Horses Lays Claim to the Valuable Qualities of Unusual Strength, Longevity, and Comfort to the Horses

nary farm work. Improvements made by careful study of such details as the bridle, neckyoke, hames, traces, and breeching, and the general "fit" of the harness, add to its effectiveness.

TOWERING BAMBOO TREES LINE BEAUTIFUL JAPANESE LANE

Because bamboo is a grass, it is not generally realized that some of its species grow to a height of 120 ft., and that

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"Bamboo Avenue," at Kyoto, Japan, Where the Thickly Clustering Stalks of a Beautiful Bamboo Forest Reach a Height of 50 or 60 Feet

Japan has whole forests of bamboo trees, 50 to 60 ft. high. So closely do the great stalks cluster that the groves are almost impenetrable, a fact which only adds to the beauty of the "ricksha" lanes cut through their depths. One such lane that penetrates a particularly beautiful forest at Kyoto, has been named "Bamboo Avenue" by occidental admirers.

RAISE BUILDING-SITE LEVEL WITH ELECTRIC SAND PUMP

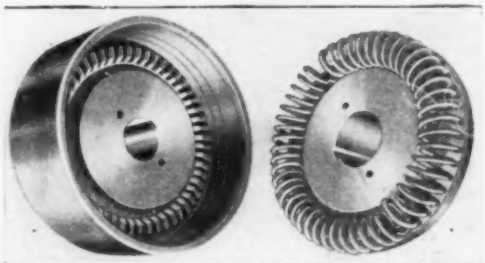
New land is literally being pumped onto a building site in a novel method of grade raising used in constructing a large manufacturing plant on the shore of Lake Michigan. Two centrifugal pumps, of 400 and 75 hp., a 10-hp. piston pump, and a 50-hp. hoist, all electrically driven, are installed on a barge which floats on an artificial pond, some 40 ft. square and 14 ft. deep. A 4-ft. ditch, about 1,000 ft. long, connects the pond with Lake Michigan. Sand and gravel are loosened by the smaller centrifugal pump and forced by the larger one through 2,000 ft. of 18-in. pipe to the building site. The grade is being raised 4 ft. or more, the pump barge advancing as it exhausts the material near it. It is estimated that ultimately it will cut a channel 200 ft. wide and nearly a mile long, which can be used later for shipping.

PREPARATION OF CONCRETE FOR USE IN SEA WATER

Concrete used for structures that are exposed to sea water should be made from a dense mixture, and its surface hardened by the application of heat and moist air before it is placed in the water, according to certain European experts, who have spent many years studying the subject. The cement should contain a large percentage of silicates, but relatively small quantities of kaolin and iron oxide. If more than two-thirds of the mortar is sand, the concrete will lack density, and is likely to be destroyed in a short time by sea water.

RESILIENT SHAFT COUPLING HAS SINGLE COIL SPRING

Two disks with radial slots, and between them a coil spring bent in a circle, its convolutions fitting into the slots, make up a new form of shaft coupling that is finding quite large market in England. It is very small in relation to the torque it transmits; is flexible without



The Two Members of the Shaft Coupling Seen in Detail: The Coils of the Spring Fit into the Slots

soft wearing surfaces; runs equally well either way, and smooths out small variations in the rotation of the driving member. It has been found adequate for the severe service of rolling mills.

RUSTIC BRIDGE WITHSTANDS BLOW FROM TREE

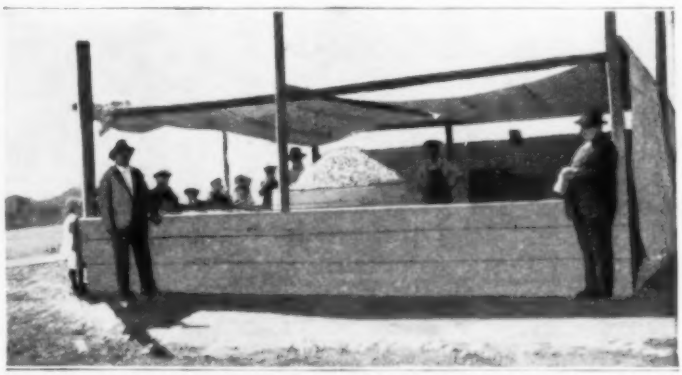
Surprisingly stable bridges are constructed in the national-forest trails by rangers, though only the crudest materials and the simplest tools are employed by the builders. Not long ago a huge red-cedar tree, toppled by a windstorm, fell on a rustic structure across a small stream in the Olympic National Forest, in the state of Washington. In spite of the heavy blow, the bridge was not entirely demolished. Utilizing portions of the damaged span, rangers quickly rebuilt the structure, which is suitable for horses as well as pedestrians.

The Rebuilt Structure, As It Looked When the Forest Rangers had Finished Their Work, can be Seen in the Picture Above

A Tremendous Blow, Struck When the Wind Blew a Giant Fir Tree across This Substantial Rustic Bridge, Located in the Olympic National Forest, Failed to Destroy the Span,

NEBRASKANS SERVE POP CORN AT FALL FESTIVAL

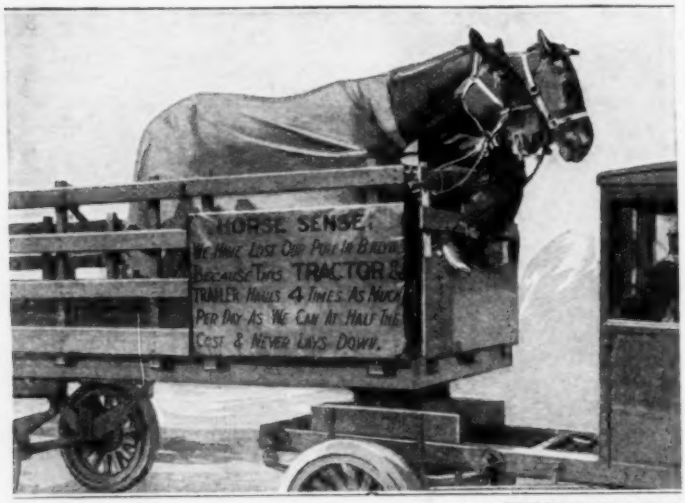
Fifteen thousand paper bags, filled with crisp, freshly prepared pop corn, were given away for the asking at North Loup, Neb., during a festival held there a few weeks ago to celebrate the importance of the locality in the production of this grain. According to residents of the town, the first crop of pop corn raised in this country was grown on a farm in that vicinity, and the local yield of recent years has been notable for its quality and quantity. Annual fêtes were instituted in 1902. To supply the demand for free refreshments at the latest festival, two mechanical poppers were kept in continuous operation by the three men in charge of the booth where the delicacy was given away. Coffee, with cream and sugar added, was also served at the pop-corn booth to those who requested it. Other features of the affair were farm-product exhibits and athletic contests. The latter included two ball games daily, in addition to races.



Free-Pop-Corn Booth: Here 15,000 Bags of the Prepared Grain were Given Away to Those Who Asked for It. The Supply in the Tub, Estimated to have Been 100 Bushels, was Distributed in a Few Hours

TRACTOR DEALER ADVERTISES INFERIORITY OF HORSES

Horse sense decrees the retirement of horses from the highway-transportation



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In This Unusual Manner a Tractor Dealer in an Eastern City Told the Public Why Gasoline Is Superior to Horses. The Novel Advertising Scheme Attracted Considerable Attention

field, according to a gasoline-tractor dealer who advertised his business in a large eastern city recently by hauling two of the beasts through the streets in a trailer attached to one of the machines he sells. Signs on the trailer announced the practical view of the dealer, and pointed out the superiority of motor-driven conveyances over horse-drawn vehicles.

PROPOSE TO TURN HELGOLAND INTO REFUGE FOR BIRDS

It is practically agreed that the island of Helgoland, late German naval base in the North Sea, has but two possible uses: the one it served in the World War, or as a sanctuary for the millions of migratory birds that have long utilized it as a temporary resting place. Since it will never be permitted to revert to its former state, there seems to be little in the way of making it a bird refuge. The proposal is made by British ornithologists, and has American support.

¶British warships are going to help British trade. Commercial travelers and business men going abroad are now permitted to use them as passenger vessels, for the first time in the history of the country.

CROSSING OF SHEEP SPECIES DEVELOPS IMPROVED WOOL

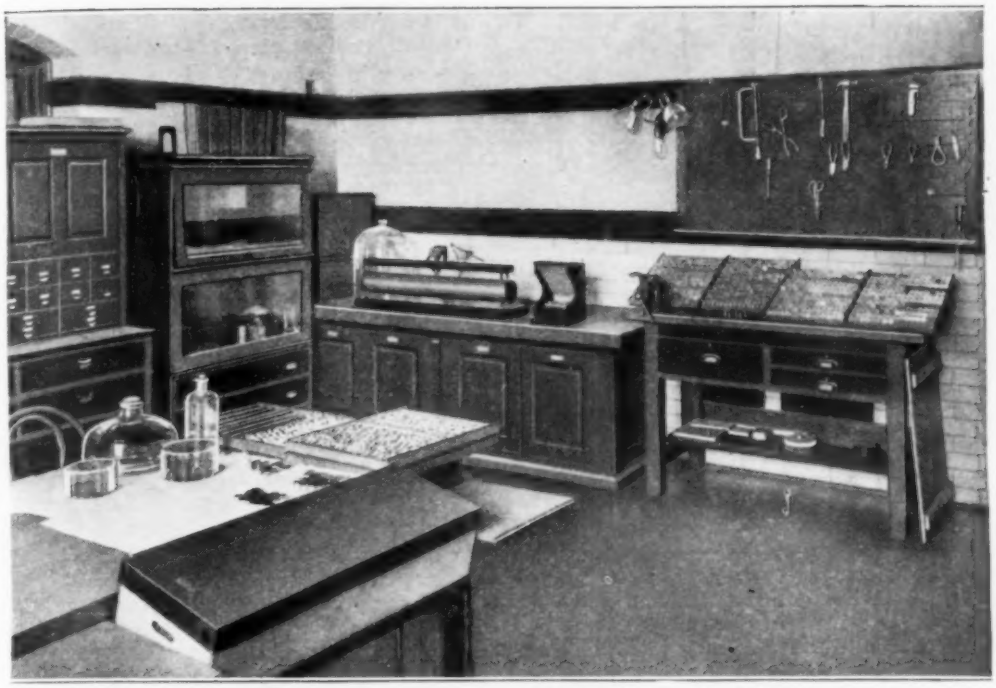
Experiments in the crossbreeding of sheep, conducted at a Scottish university, indicate that the fine wools of increasing demand may be grown in greater quantities by scientific methods. A fleece of great strength, producing exceptionally fine woolen and worsted fabrics, results from the crossing of Southdown and Soay sheep. Both the wool and the flesh obtained by crossbreeding Southdown and blackface sheep are of unusual quality, the fleece, though short, being very thick and forming when spun a cloth of merinolike texture. The Siberian mouflon stock obtained from Petrograd, bred with the reddish-coated Shetland animal, gives a soft, silky wool of brown hue, that takes the place of alpaca, and is excellent for knitting.

TUBES FROM PICKER'S HANDS SPEED BERRY HARVESTING

Giving all his effort to the single operation of picking, and allowing gravity to place the berries in the boxes, a harvester

The Harvester has Unstrapped the Container at the Left to Show the Berry Boxes, and the Leather Funnels into Which He Slips His Hands. The Apparatus is Shown in Operating Position at the Right

equipped with a new apparatus can strip a berry bush with lightning speed. From



Steel-Gauge Testing Room in the United States Bureau of Standards: The Little Disks are Seen in the Cases at the Right, and, in Individual Packing, on the Table at the Left. Various Testing Devices are to be Seen Here

the container, strapped to his waist and containing two or three berry boxes, two flexible tubes lead to leather funnels which button around his wrists. As the berries are removed from the bush, they fall into the funnels and roll down into the boxes.

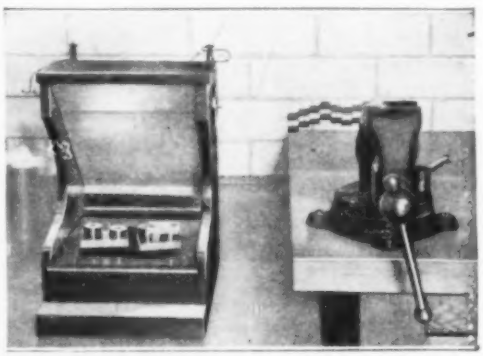
POLITICAL CANDIDATES' WIVES POOL CHANCES ON HOUSE

In these days of house shortage, political candidates for state office face the pre-election dilemma that they may, or may not, need a dwelling at the state capitol; and landlords do not sign contingent leases. Recognizing, however, that one of them must inevitably need a home, the wives of two opposing candidates in Kentucky formed an agreement, pooled their interests, and went house hunting together. Thus it was necessary to lease only one house, the winner at the polls taking the prize.

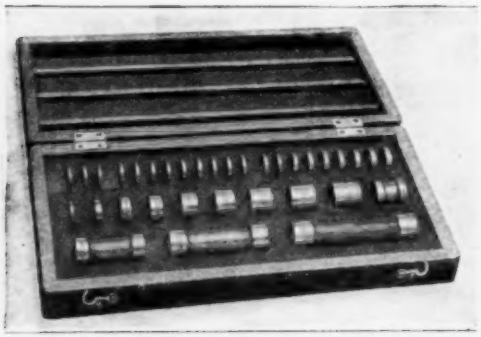
¶Actual earning capacity rather than net tonnage will hereafter govern the levying of tolls at the Panama Canal, according to a bill which recently passed the House of Representatives and was sent to the Senate.

THOUSANDTH-INCH TOO GROSS: WORK NOW TO MILLIONTH

Steel gauges accurate to the incredible fineness of a millionth part of an inch are now being made in quantities at the U. S. Bureau of Standards. So extraordinarily precise is the method of manufacture, simple as it is, that in one instance 31 finished gauges out of a lot of 53 were absolutely accurate to .000,001 in., and the balance all within .000,002 in. of precision. The gauges are steel disks,



At the Left, the Light-Interference Testing Apparatus; At the Right, Disk Gauges in Cohesion after being Wrung Together



A Set of the Bureau of Standards' Steel Gauges, Accurate to the Millionth Part of an Inch, Assembled in Their Case Ready for Use

⅞ in. in diameter, the faces ground smooth and parallel. A center hole permits assembling several on a rod to build up any desired dimension. When thrust or "wrung" together, the perfect faces cohere so firmly that some pounds of effort is required to pull them apart.

The machine that does the finish lapping on these surfaces is a war product, designed by an ordnance officer. It consists essentially of a fixed lower and gravity upper plate, between which the gauges are oscillated in a chuck plate. The operation is timed exactly by a stop clock. The final tests are made optically, interference lines of light being used to detect deviations from perfection.

THE FIRST FLIGHT OVER A PEAK OF THE ROCKIES

By J. A. CHAPMAN

THE public has been informed fulsomely about the conquest of the ocean and the crossing of the continent by air, but little has so far been made known about the daring flight of two army pilots in the first trip over the continental divide and one of the highest peaks of the Rocky Mountain chain, made before the recent cross-country air race. The mountain was Long's Peak, in Colorado—an eminence that outtops the more famous Pike's Peak by 246 feet.

The two birdmen had flown from Ellington Field to Glenwood Springs, Colo., and from there across the Rockies over Berthoud Pass, with six other fliers in three other planes, a squadron touring the West to stimulate interest in the air service. The two were assigned to do "stunts" over the town of Loveland, the gateway to Rocky Mountain National Park, one of the state's great scenic wonderlands. After doing this, they decided to climb Long's Peak, 30 miles southwestward, "on their own hook." Flying over the famous Big Thompson route into Estes Park, they astonished hotel guests there with their unannounced appearance. They then began to gain altitude in order to skim the top of the peak.

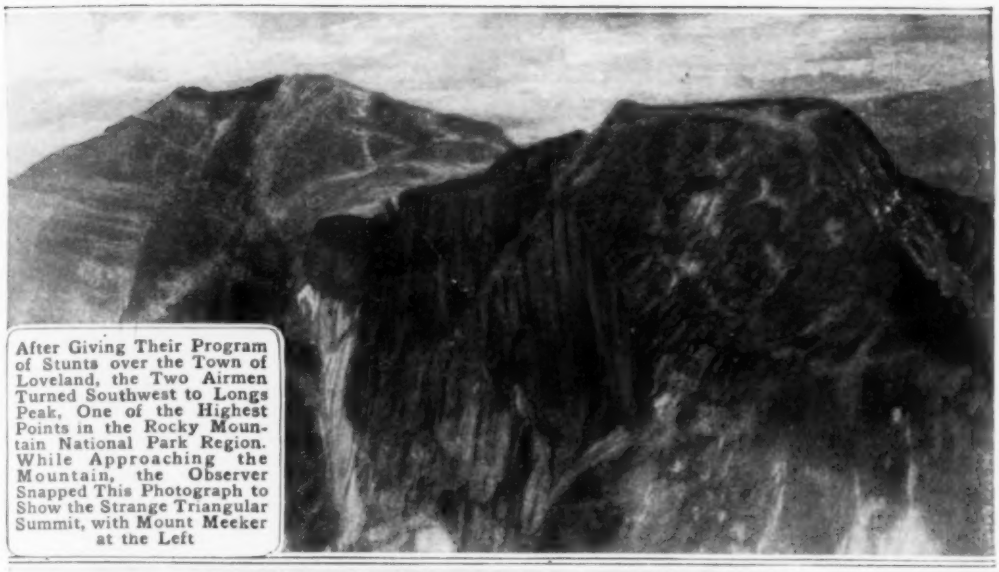
Gaining altitude was the bugbear of the trip. The DeHaviland bombing plane, not designed for high flying, was tilted high in the air and the 400-hp. Liberty motor was given every atom of gasoline it could burn in order that the climb might be made. The air, naturally thin at such a height, was made even more tenuous to the powerful 8-ft. propeller of the plane by an unusual drought in a dry country. Airmen will tell you that wet air is much easier to fly in than dry.

Besides, the mountainous country, alternately wooded and rocky, with here and there a lake, made the density of the atmosphere so uneven that both fliers declared that it was the bumpiest and most dangerous flight they had ever undertaken. The plane, weighing two tons and heavily laden with gasoline and baggage, would sink sometimes 300 ft., as if it had been dropped.

One of the men risked his life many times in taking photographs. The depth of the cockpit was so great that, in order to snap the camera—which was not an aviation type, and therefore more difficult to handle in the air—the photographer had to loosen the safety strap and stand up in the machine. More than once he was nearly left behind, or rather above, when the machine would strike an air pocket and drop away from him.

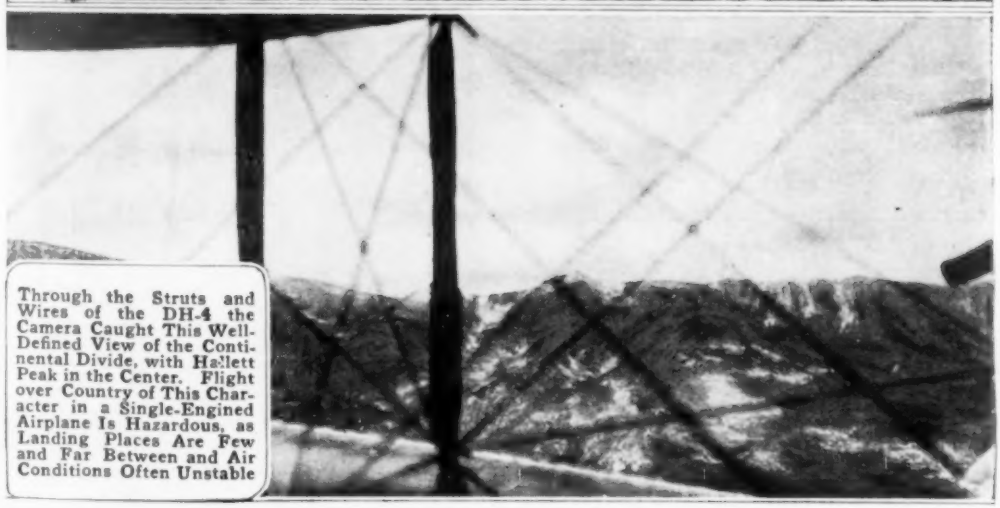
The route of the men included Rocky Mountain National Park, a glimpse of the continental divide, a comprehensive view of the far-famed Moffat Road, several towns and summer resorts, and the city of Denver, and was accomplished in less than three hours, with the use of only 30 gal. of gasoline. The speed of the plane, at the highest level reached during the flight, was cut from 110 miles an hour to 75 by the thinness of the air.

The success of the airmen in their trip, which accomplished what would take a motorist days to do, has demonstrated that there is a future for the airplane in the sight-seeing game in mountainous countries as well as on the seashore.



After Giving Their Program of Stunts over the Town of Loveland, the Two Airmen Turned Southwest to Longs Peak, One of the Highest Points in the Rocky Mountain National Park Region. While Approaching the Mountain, the Observer Snapped This Photograph to Show the Strange Triangular Summit, with Mount Meeker at the Left

The Observer Took This Picture to Show the Succession of Tunnels and Fills Which Enable This Railroad, One of the Highest in the World, to Climb over and through the Rocky Mountains. Four Tunnels Are Visible in This One Photograph



Through the Struts and Wires of the DH-4 the Camera Caught This Well-Defined View of the Continental Divide, with Hallett Peak in the Center. Flight over Country of This Character in a Single-Engined Airplane Is Hazardous, as Landing Places Are Few and Far Between and Air Conditions Often Unstable

PHOTOS COPYRIGHT, J. A. CHAPMAN

CLOSED STALLS FOR PATRONS OF ODD SHOE-REPAIR SHOP

Since leather joined the high-cost list, the art of shoe repairing has taken on many features of refinement. One popular shop has enhanced the comfort of its customers by providing a long row of stalls, some 30 in. in height, each closed by a door and furnished with a comfortable chair. With his pedal extremities thus secluded, the patron may read or rest at ease while his shoes are given additional mileage.

Individual Stalls for Customers of a Modern Shoe-Repair Shop, Where the Patrons may Sit at Ease in Semiseclusion

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IRON ADHERES TO CONCRETE ONLY BY FRICTION, CLAIM

European engineers studying the properties of reinforced concrete claim that the friction of the contracting concrete on the iron is what causes adhesion between them, as they have no true cohesion. The concrete must wholly surround the iron properly to adhere to it. Contraction with age strengthens the structure by increasing the friction. Conclusions point to the desirability of computing the tensile strength of concrete, and obtaining a figure for its minimum thickness around the reinforcing.

¶An all-American route for a new submarine cable to Asia is proposed in a War Department report to a senate committee now investigating the subject. Cape Flattery, Wash., to Alaska, to the Philippines is the suggested route, which is declared to be free from ice interference.

TESTS OF GAS TUBING REVEAL DANGEROUS CONSTRUCTION

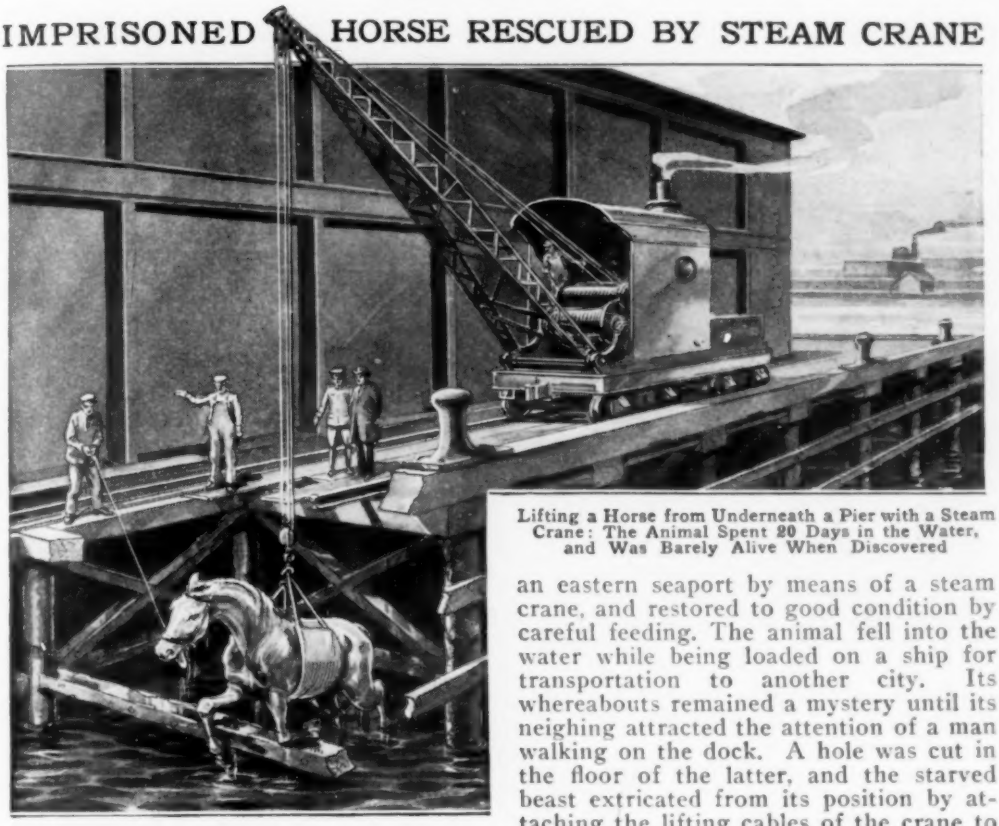
After carefully examining a large number of samples, the Bureau of Standards announced recently that much of the flexible gas tubing on the market is poorly constructed, and therefore dangerous. Some was found to be made from paper, covered with a tar compound. It was recommended that steps be taken to prohibit the use of this type of tubing. The experiments showed a great variation in the quality of rubber end pieces. Generally speaking, the higher-priced tubing was found to be far superior to cheaper material. As a result of the inquiry, it is expected that standard specifications for gas tubing will be formulated by the bureau, coöperating with other organizations interested in the subject.

OCCUPANTS OF PARK BENCHES FACE AWAY FROM WALKS

Strollers in a small public park, located in the business section of Los Angeles, are no longer annoyed and embarrassed by the curious gaze of persons seated on the benches along the edges of the walks, as was formerly the case. The reason is that the benches have been turned around, and their occupants now face the lawn, not the walks. Numerous complaints caused the city authorities to make the change. Habitual loafers evidently do not like the new arrangement, as the benches are seldom crowded now.

Seated with Their Backs to the Walk, the Occupants of These Park Benches cannot Annoy Passers-By by Staring at Them

IMPRISONED HORSE RESCUED BY STEAM CRANE

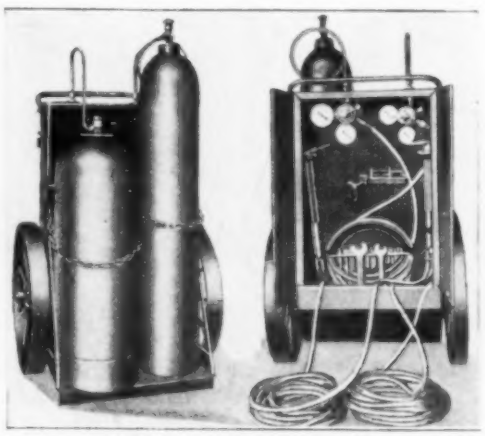


Lifting a Horse from Underneath a Pier with a Steam Crane: The Animal Spent 20 Days in the Water, and Was Barely Alive When Discovered

Discovered underneath a pier, where it had been confined without food or fresh water for 20 days, a weak and emaciated army horse, almost dead from its experience, was rescued recently at an eastern seaport by means of a steam crane, and restored to good condition by careful feeding. The animal fell into the water while being loaded on a ship for transportation to another city. Its whereabouts remained a mystery until its neighing attracted the attention of a man walking on the dock. A hole was cut in the floor of the latter, and the starved beast extricated from its position by attaching the lifting cables of the crane to a sling passed around its body. An investigation disclosed the fact that the horse had been imprisoned by the timbers supporting the pier. The animal regained its strength in a remarkably short time.

PORTABLE LOCKER HOUSES ALL WELDING EQUIPMENT

Installed on a steel "cabinet truck," a welding or cutting outfit is easily handled during working hours and securely protected at other times. The body of the truck consists of a steel cabinet, or locker, the base of which is extended rearward to support the oxygen and acetylene cylinders. Within the cabinet are racks and trays which hold all necessary welding and cutting torches, tips, hose, regulators, gauges, and other accessories. The whole equipment is mounted on two broad-tired wheels.



In the Steel Cabinet at the Right are Contained All the Tools and Accessories Used in Welding and Cutting. A Shelf in the Rear Holds the Two Gas Tanks as Seen at the Left

¶The first battleship built in a Pacific-coast navy yard was launched recently at Mare Island, Calif., when the "California" left the ways.

PHOTOGRAPHS GIVE PROOF OF MOUNTAIN CLIMBING

When tourists of the Pacific Northwest return to their homes and declare they have ascended Mount Rainier, the highest mountain in the United States, they offer as proof of their assertion a photograph of themselves climbing the mountain, so none may find opportunity to scoff at their claim.

The Mount Rainier Photographer: At His Summit Studio He Supplies Pictorial Evidence to Mountain Climbers Who Want to Prove Their Exploit

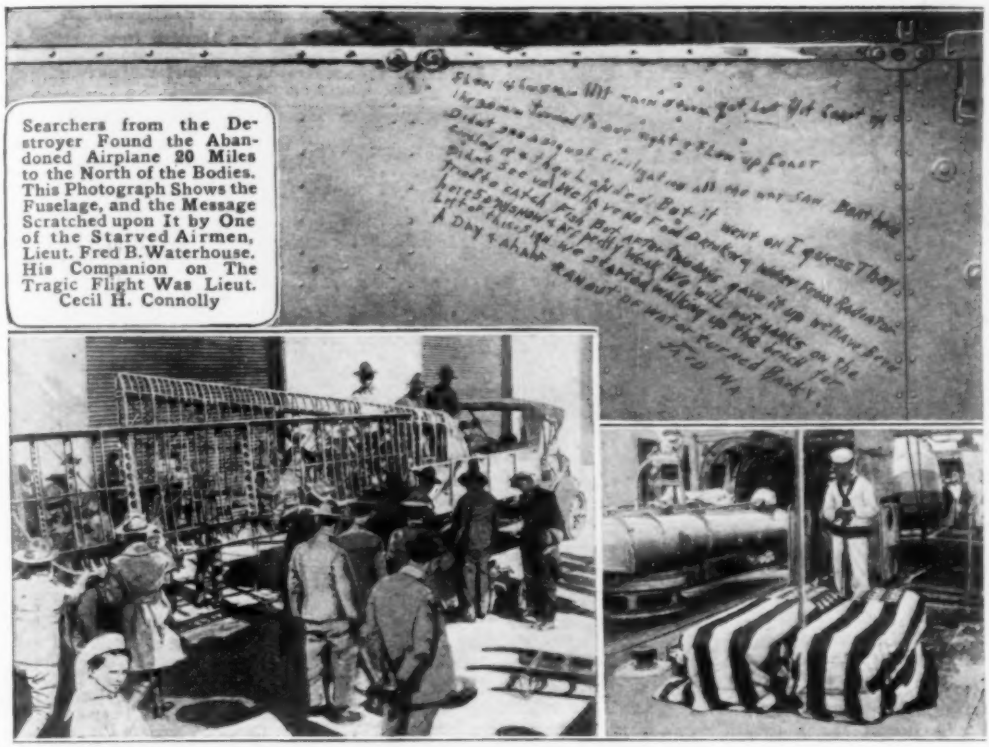
For three months every season an official photographer is stationed at Rainier National Park. He does his work high up on Mount Rainier. He takes pictures of persons ascending the mountain and has the photographs ready for them when they return. During the last season he has snapped and registered 8,000 persons.

The filing cabinet of the park's official photographer is a miniature directory of the United States. The collection includes likenesses of industrial magnates, government officials, state, county, and city officers galore, educational workers, also globe-trotters, perpetual tourists, family parties, and many visitors from foreign countries.

SNAKE RIVER CANON SPANNED BY NEW SUSPENSION BRIDGE

As long as the city of Twin Falls, Idaho, has existed, on the brink of the Snake River's deep and precipitous cañon, it has been handicapped by its difficulty of access from the other side of the river. But at last the chasm has been spanned by a remarkable suspension bridge, whose steel floor hangs 290 ft. above the brawling torrent of the Snake. The cañon's narrowest point, selected for the crossing, still leaves a quarter-mile between the 50-ft. steel towers of the bridge, whose feet are solidly cemented into the rocky rim of the gorge. The 12 two-inch cables that support the structure run inland 100 ft. behind the towers and terminate in huge hooks imbedded in great blocks of concrete. The bridge reduces by miles the old route across the cañon, and brings the great tributary region to the north within easier reach of the city, besides opening new fields to the tourist.

The View across the New Suspension Bridge at the Left Shows the Uncompleted Floor with Its Checkerboard of Temporary Timbers. Above Is a View of the Cañon at the Crossing, with Half the Bridge in Place 290 Feet above the Surface of the River



Searchers from the Destroyer Found the Abandoned Airplane 20 Miles to the North of the Bodies. This Photograph Shows the Fuselage, and the Message Scratched upon It by One of the Starved Airmen, Lieut. Fred B. Waterhouse. His Companion on The Tragic Flight Was Lieut. Cecil H. Connolly

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Although the Pilot Brought the Plane to a Perfect Landing on the Lonely Beach, Mexicans Subsequently Removed the Engine, and Stole the Portable Equipment, Leaving Only That Part of the Machine Shown at the Left. The Deck of the Little Warship, Bearing the Flag-Draped Caskets, is Shown at the Right

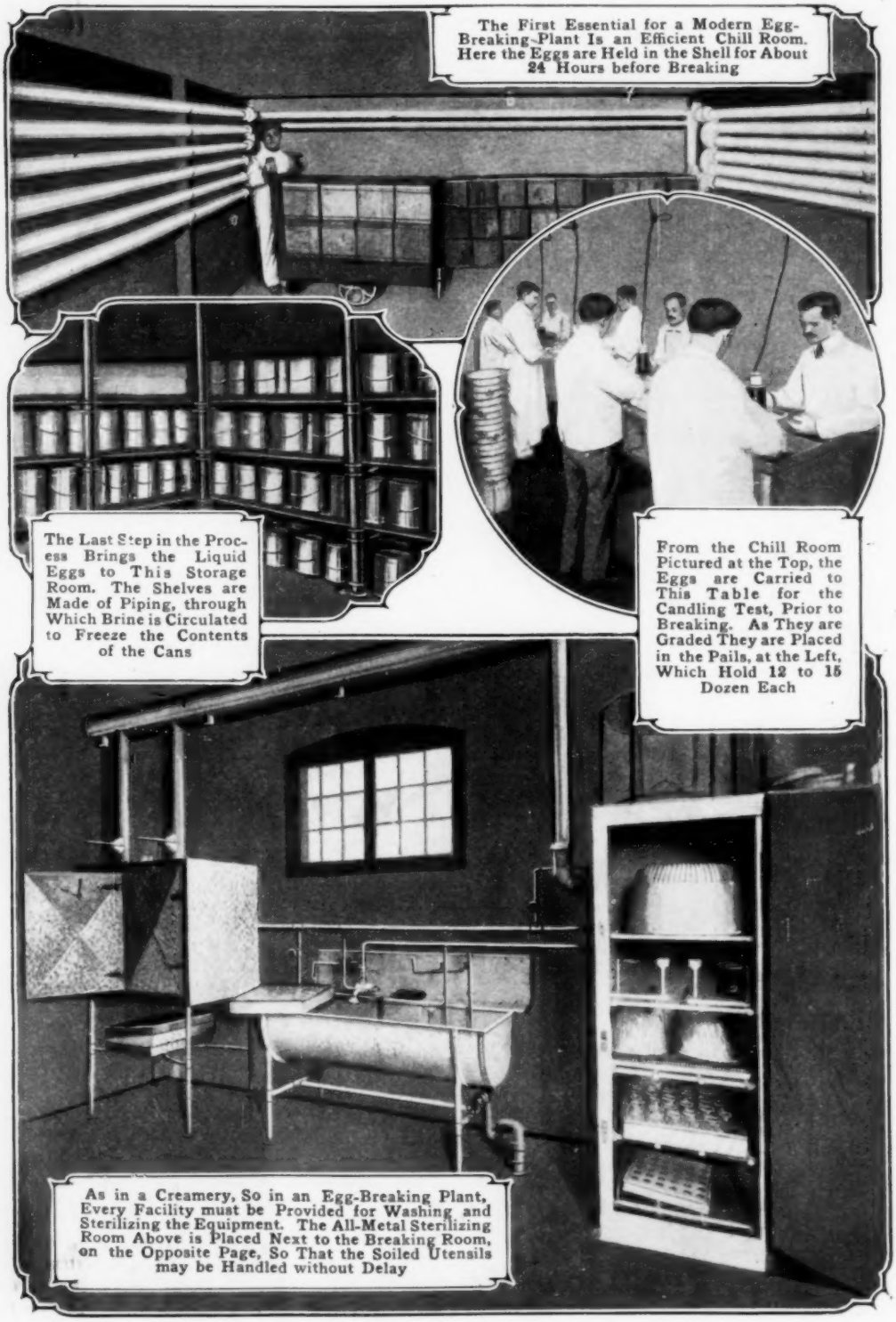
AIRMEN MURDERED BY MEXICAN FISHERMEN

Two mutilated bodies, half hidden in the sand on the west coast of the California Gulf, were recently found by an American mining engineer. Making his way to the border, he reported his find, and thus dissolved the mystery which long veiled the fate of two army airmen. A landing party, from a destroyer dispatched to the scene, found the bodies as described, and, 20 miles to the north, came upon the looted plane. Here, scratched by the starving airmen on wings and fuselage, was read the story of their mishap and subsequent suffering. Pilot and observer in a DH-4, they had lost their way in a rainstorm while flying on patrol from Yuma, Ariz., to San Diego, Calif. Emerging from the storm, they mistook the Gulf of California for the Pacific Ocean, so flew southward until forced to land on a lonely beach. For two days, the pitiful record shows, they attempted vainly to appease their hunger by catching fish. Three days more were lost in a tramp northward across the desert, to be halted by their lack of water. They struggled back to the stranded plane, and with water from the radiator, kept life in their bodies until the coming of two Mexican fishermen. Here the record stops; but the broken bodies are evidence that they were lured southward, and five days later, while they slept, were stabbed to death.

ELECTRIC FLASHLIGHT USES WET BATTERY THAT TILTS

The idea of replacing the dry battery of the familiar electric flashlight with a wet battery, dispensing with a switch and tilting the cell to bring the liquid in contact with the plates, has been worked out in a new German lamp. Zinc and peroxide of lead are the two plate materials, sulphuric acid being the electrolyte. The peroxide plate is exhausted in about 25 hours' use, and is then taken out and a recharged one substituted. Charging the plates is an economical operation, and they may be stored for long periods. The cell gives about two and a half volts.

EGG-BREAKING PLANTS BROUGHT BY GOVERNMENT



The First Essential for a Modern Egg-Breaking Plant Is an Efficient Chill Room. Here the Eggs are Held in the Shell for About 24 Hours before Breaking

The Last Step in the Process Brings the Liquid Eggs to This Storage Room. The Shelves are Made of Piping, through Which Brine is Circulated to Freeze the Contents of the Cans

From the Chill Room Pictured at the Top, the Eggs are Carried to This Table for the Candling Test, Prior to Breaking. As They are Graded They are Placed in the Pails, at the Left, Which Hold 12 to 15 Dozen Each

As in a Creamery, So in an Egg-Breaking Plant, Every Facility must be Provided for Washing and Sterilizing the Equipment. The All-Metal Sterilizing Room Above is Placed Next to the Breaking Room, on the Opposite Page, So That the Soiled Utensils may be Handled without Delay

TO STATE OF HIGH EFFICIENCY AND SANITATION

The Breaking Room, Above, Ill-Lighted, Insanitary, with Operators Ununiformed, Is Typical of Conditions That Were Common before the Educational Campaign of the Department of Agriculture

The Sanitary Breaking Table at the Right Conforms to Government Suggestion. Broken on the Knife, the Egg is Dropped into a Cup for Regrading. Shells Fall through the Funnel into the Can Below

Contrast This White-Enameled Breaking Room with the One Pictured Above. Here, Light is Evenly Distributed from Windows on Two Sides of the Room. As All Eggs Opened Here are Regraded, Only the Best are Finally Stored on the Brine-Pipe Shelves, as Pictured on the Opposite Page

SIDECAR TAXI IS FRENCH MOTOR NOVELTY

The sidecar taxi is a French motor novelty of recent introduction that should prove popular for quick transportation about crowded city streets. The passenger rides in comfort, as he is completely protected by the decked-over body, folding top, and queer semispherical windshield. The meter is carried conspicuously on the nose of the little body.

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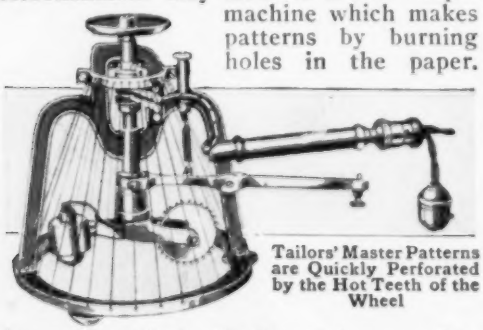
Attached to a Motorcycle, the Little Closed Body Becomes a Sidecar Taxi That can Outspeed and Outdodge the Fastest Automobile. The Passenger is Well Shielded from Flying Mud and Bad Weather

TAILORS' MASTER PATTERNS MADE BY HEATED TOOL

For the cutting room of the tailoring establishment may now be had a simple machine which makes patterns by burning holes in the paper.



Tailors' Master Patterns are Quickly Perforated by the Hot Teeth of the Wheel

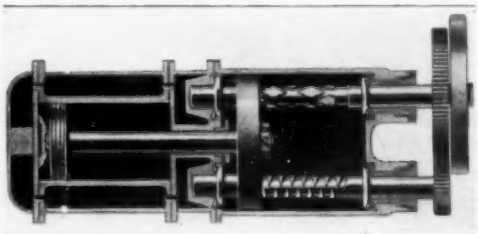
A small toothed wheel contains a resistance coil which heats the teeth to the desired temperature. As it is pushed along the penciled lines of the master pattern, the wheel thus leaves behind it a perforated trail. With patterns made in this way, the various designs are laid out, once and for all, in the most economical arrangement, and are quickly transferred to the cloth by the application of chalk dust.

CHEMICAL FILLING OF PORES MAKES WOOD FIREPROOF

Wood is made virtually fireproof by a new English method, which fills the pores with a crystalline deposit of fire-resistant chemicals. The air and moisture content of the pores is extracted, and the sap water dissipated, by a steaming and vacuum process in a closed chamber. The empty cells are then impregnated with the chemicals by hydraulic pressure. When the solution has dried, each cell of the wood remains filled with crystals, which expand on exposure to heat and prevent the entrance of air. Wood so treated will char, but not burn.

ENGINE WITHOUT CRANK TURNS SHAFT BY SCREW PRINCIPLE

Many an inventor has searched the list of mechanical movements for a means to rescue the reciprocating engine from its cumbersome crank, but usually without success. A horizontal gasoline engine, built in Australia on the crankless principle, has attained speeds of 3,000 r.p.m., and develops 16 hp. in a space 22 in. long and 10 in. wide. The cylinder is double-acting, about 4-in. stroke and 3⅜-in. bore. The crosshead slides longitudinally on the driving shaft, which is grooved helically in both right and left directions at a long pitch, and turns when the piston moves. A gear drives a second shaft grooved in a shorter pitch, which acts to start the crosshead back at the end of each stroke. Thus the flywheel is kept turning.

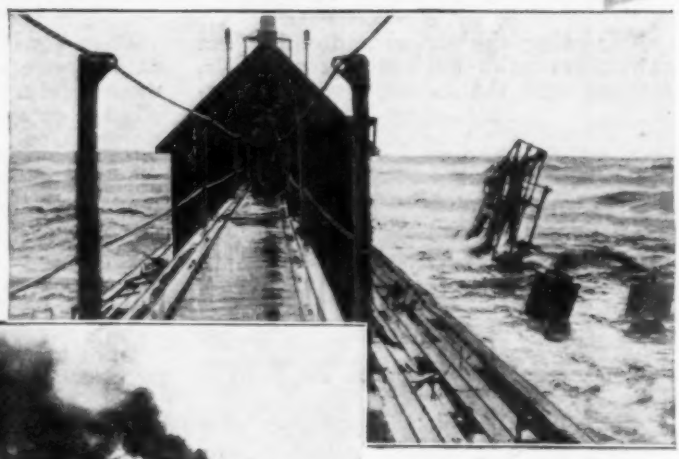


BY COURTESY OF THE MOTOR CYCLE, LONDON

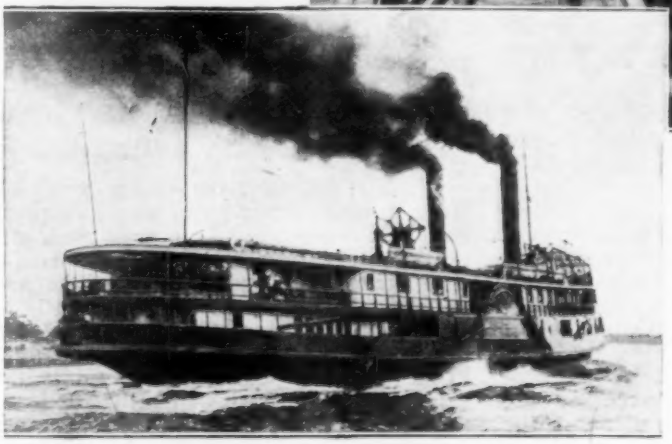
The Piston's Reciprocating Motion is Changed to Rotation by the Helical Grooves in the Shaft Which Turns the Flywheel

LAKE MICHIGAN SMASHES ANOTHER STEAMER

The first of the winter gales on the treacherous Great Lakes has added one more to the long list of lost ships. The iron sidewheel steamer "City of Muskegon," leaving Milwaukee, Wis., one recent night, ran into an exceptionally violent northwest storm that literally blew it across Lake Michigan into the very shadow of its destination before destroying it. Entrance to the harbor of Muskegon, Mich., is between two mile-long piers some 300 ft. apart; and against one of these piers the helpless steamer was hurled bodily by the resistless waters. It pounded to pieces in a few minutes, and went down in 50 ft. of water almost alongside of a coast-guard station, taking with it many of its 37 passengers and crew of 35. The ship was formerly named the "City of Holland." It was built in 1881, was 231 ft. long, and of 1,148 gross tons.



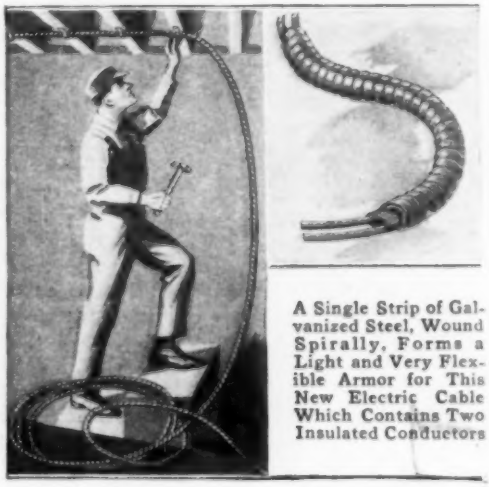
The Steamer Lying in 50 Feet of Water off the Muskegon Pier, Only Its Walking Beam and Funnels Showing above the Surface



The Great Lakes Steamer "City of Muskegon," Formerly Known as the "City of Holland," Wrecked at the Entrance of Muskegon Harbor in the First Winter Gale

ELECTRIC WIRES PROTECTED BY ONE-PIECE ARMOR

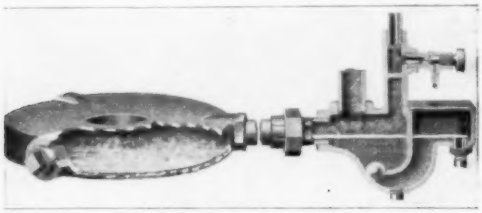
Flexible metal-armored electric-current conductors have been employed for some time as a means to reduce fire danger in buildings, but their use has been restricted somewhat by their weight and high cost. These disadvantages are declared to have been eliminated in a new cable, which is covered with a single strip of galvanized steel. The material is wound spirally, with its edges interlocked and gasketed to form a light, inexpensive, and nearly water-tight tube that can be bent without damage. Insulated wires are contained in the tube. At present, the cable is manufactured only in one size, containing two conductors. Metal clamps are used to attach the material.



A Single Strip of Galvanized Steel, Wound Spirally, Forms a Light and Very Flexible Armor for This New Electric Cable Which Contains Two Insulated Conductors

STEAM GENERATOR IN FURNACE MOISTENS AIR OF HOUSE

Moistening the air of a dwelling not only saves coal, but promotes health, comfort, and the durability of the furnishings, and is easily accomplished with a new steam generator designed for installing just above the furnace fire box. The steam drum, five to eight inches in diameter and an inch or so high, is supplied with filtered water by a finely regulated drip valve. The steam passes into the living rooms through its own floor registers or radiator nozzles. It is readily attached to any steam, water, or air system of heating.



The Steam Drum on the Left End Is over the Coals of the Furnace, a Thin Sheet of Water being Admitted to It through the Adjustable Drip Valve at the Other End

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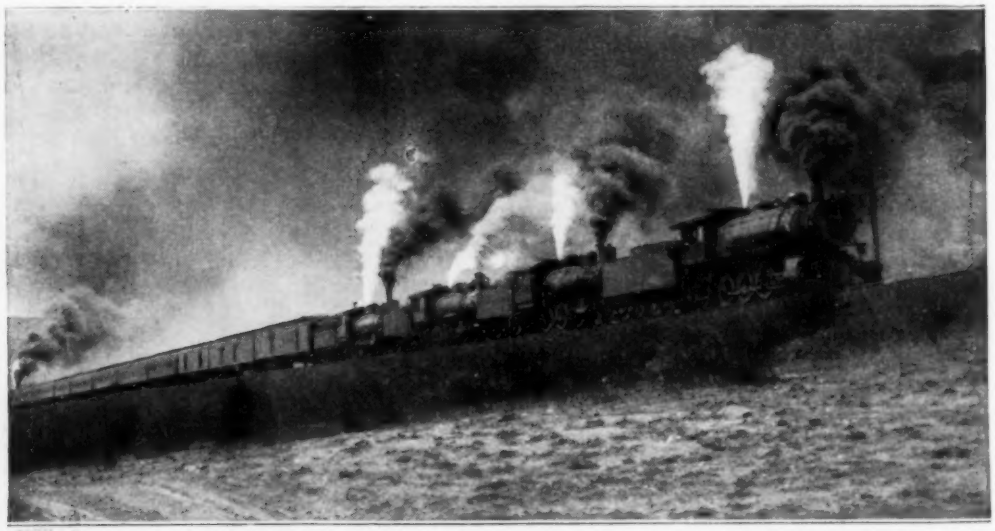
¶The Chamber of Commerce of the United States of America is planning the erection of a permanent home in Washington, D. C., to cost about $2,500,000, and a site opposite Lafayette Square already has been selected.

ENGINEERS TO STUDY PLANS FOR INDIANA DUNE PARK

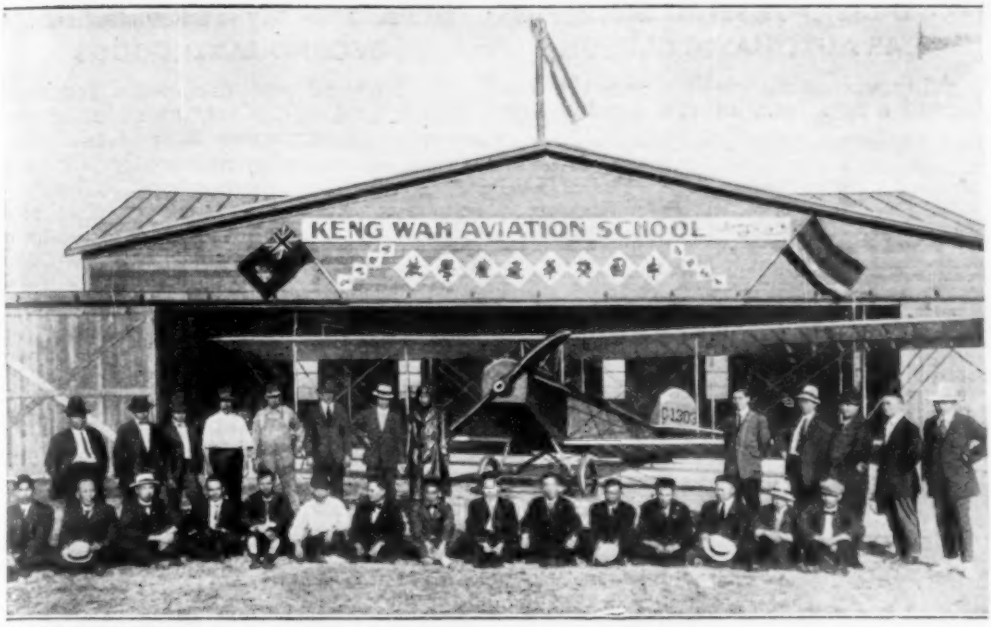
Plans for the preservation of Indiana's natural wonderland, the Lake Michigan dunes, recently advanced another step when a compromise was effected with a Porter County commercial association, hitherto antagonistic to the project. The opposition was based on the assumption that the county's industries would be deprived of water frontage, and commercial development hindered. Now three engineers are to be appointed to study the location of boundary lines for the reserve. Their duty will be to preserve a proper balance between commercial and esthetic considerations in planning the park.

MOUNTAIN RAILROAD TRAINS MOVED BY FIVE ENGINES

Western railroads once were noted for steep grades, but most of these inequalities have been smoothed until their negotiation by powerful modern locomotives means little loss in time or increase in fuel consumption. Until recently, a stretch of track over the Wasatch Mountains, northern Utah, presented difficulties in its inclines. Between some points, the rails rose at the rate of nearly 370 ft. to the mile, and five engines often were required to move an ordinary passenger train upgrade. A more nearly level detour, 15 miles long, now makes it unnecessary to use this portion of the line.



Passenger Train Crossing the Wasatch Mountains: Even with Five Locomotives Pushing and Pulling the Cars, Progress Is Slow on the Steep Grades. A Detour Now Makes It Possible for Traffic to Avoid This Stretch of Track



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Assembled Before Their Hangar at Saskatoon, Canada, are Seen the Chinese Instructors, Mechanics, and Students of the Keng Wah Aviation School

CHINESE IN CANADA HAVE OWN FLYING SCHOOL

A Chinese flying school is now well established at Saskatoon, Canada, for the purpose of training airmen who will eventually return to China and there help put aviation on a commercial basis. The venture is financed by a patriotic society of more than 2,000,000 members, and has already proved itself a success by turning out several capable pilots. Half a dozen others are now well advanced in "solo" flying. The daily work at the school has demonstrated that the Oriental has an acute sense of balance, and a faculty of cool, unhurried thinking that serves him well in the occasional crises of the flying field.

CALIFORNIA SETTLERS TO GET BOTH FARMS AND FUNDS

Homesteaders will have a chance to acquire both farms and financial assistance in California next spring, when the state land-settlement board, will open 12,000 acres to settlers. Under the plan adopted, farmers may borrow money to establish themselves, and repay the loan in easy installments. The state's previous experiments in this direction have been quite successful.

MACHINE PRINTS LAUNDRY MARKS ON CLOTHING

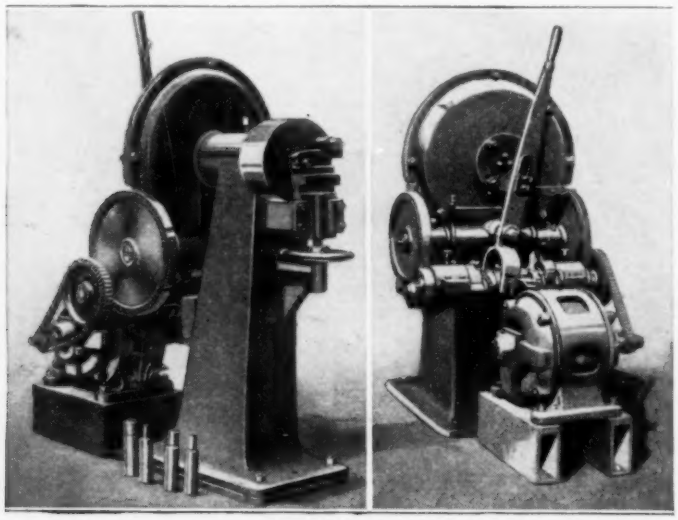
Electric marking machines are now doing the work formerly done in many large laundries by hand.

One of these units, with its electric motor and iron base, is illustrated, and seems superficially to resemble an adding machine. Placing the collar, or shirt, on the pad at the left, the operator punches the proper keys and pulls the lever. The machine automatically alines and inks the type and, in the hands of a skilled worker, will mark as many as 400 pieces in an hour. The standard equipment will print any mark containing not more than 19 characters.

¶A harmless fluid which removes rust or lime stains from porcelain, glass, marble, and enamelware, has been added to the list of cleansing agents.

COLD-BEND TESTING MACHINE HAS AUTOMATIC CLUTCH

An ingenious automatic stop is the feature of a new form of cold-bend metal-testing machine. A powerful electric motor drives the bending disk through worm wheel and gearing, and two friction clutches, with a hand shift lever, allow rotation in either direction. The test metal is bent around a pin of the desired diameter by the slow rotation of the disk. A smaller disk at the back carries a pin which, at a predetermined point, strikes a lug on the clutch lever, whether its position be forward or reverse, thus instantly stopping the rotation. All movements are adjustable, and bending pins of any size may be inserted.



In the Front View of the Cold-Bend Testing Machine, on the Left, a Test Piece is Seen Broken at the Bend. The Rear View, at the Right, Reveals the Driving Motor and Gears, and the Clutch Lever Whose Operation by the Revolving Disk Constitutes the Automatic Feature

MAGNESIUM-CHLORIDE CEMENT IMPROVED BY COMPOUNDING

For the manufacture of imitation marble and stone, and for white ornaments, it has been found that the magnesium chloride commonly used as a base is improved by adding .38 per cent of magnesium oxide. If the chloride is in a saturated solution, 33 per cent of the oxide may be added. The result is a white, hard substance quite resistant to change. It sets in 8 to 36 hours at ordinary temperatures, and is unaffected by mixing with nearly its own quantity of inert matter.

DEPARTMENT STORE HANDLES SECONDHAND GOODS

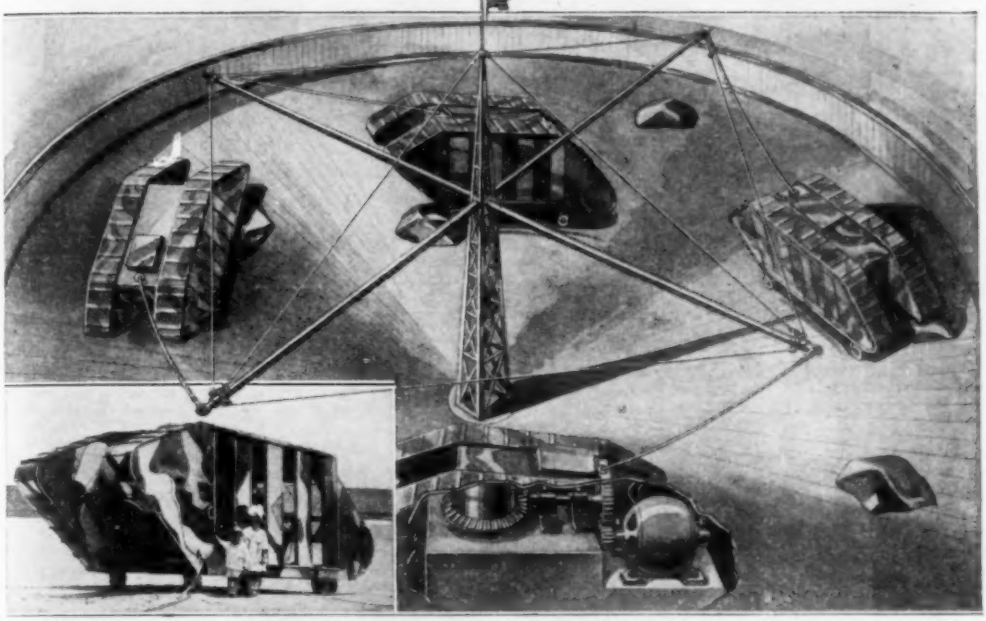
Secondhand and shop-worn merchandise is sold exclusively in a department store that was established recently in a large eastern city. Much of the stock is purchased from wealthy individuals, particularly women, who dispose of their surplus clothing and other articles in this manner. Another source of supply exists in the high-class shops, where samples which have become soiled or faded are obtained by the store's buyers, three in number. Since the goods are acquired at only a fraction of their original cost, in most cases, they are sold at extremely low prices, though often the price is no indication of their real value. Practically everything handled by an ordinary department store is offered for sale, including men's clothing, women's wearing apparel, shoes, furniture, furs, and jewelry.

TOOL MAKES COIL SPRINGS FOR EYEGLASS MOUNTINGS

Eyeglass mountings that grip the wearer's nose with little finger levers have become so popular that a small tool has now been devised for making and placing the minute coil springs used. It consists simply of a hollow pencil-like rod through which the gold wire is fed from a little spool at the other end. The end of the wire is bent around the eyeglass guard, given enough turns to make a spring, and is then cut off.

¶ Electrification of all the railways in Chile operated by the state, some 2,300 miles, is a new South American project.

ROUGH-RIDING TANK AS AMUSEMENT CAR

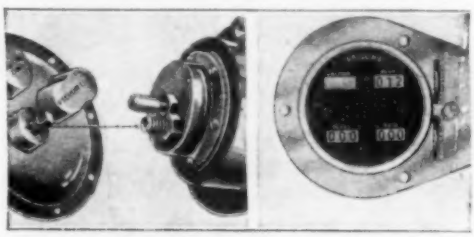


The Imitation Tanks, and the Electrically Driven Revolving Steel Tower Whose Extended Arms Draw Them about the Wood Bowl. The Insert Gives a Close-Up View of One of the Tanks with Its Camouflage Decorations

It was inevitable that the army tank's reputation as a rough rider should serve to inspire the authors of amusement-park thrills. The tank slogan, "treat 'em rough," taken as applying to the occupants, fits in well with the modern idea of entertainment. Now one of the great resorts for pleasure seekers in the East has installed, as its latest joy stimulant, a set of four counterfeit tanks, dressed in camouflage paint, that bump around the inside of a wooden bowl with about an acre of surface. The make-believes are light, with transverse seats like a street car, and run on wheels instead of crawling on a flat tread; but they stagger along over carefully designed bumps and rough spots with satisfying realism. Their power is supplied by a revolving tower of skeleton steel in the center of the bowl, with towing cables attached to four projecting arms at the top. As an electric motor in the base rotates the tower, centrifugal force carries the tanks nearer and nearer the edge of the bowl, adding further zest to the adventure.

FUEL CONSUMED BY MOTOR CAR SHOWN BY METER

A dash instrument which records information regarding the gasoline consumption of an automobile is being manufactured in a southern state. In appearance, the device resembles an odometer, but, instead of registering mileage, it indicates the amount of fuel used during a season, or on a trip, and the quantity in the tank, besides giving warning if the vacuum system is not functioning properly. The latter is accomplished by colored signals which appear in an aperture in the face of the meter. Provision is made for resetting the contrivance at the end of a trip or at the close of a season. Metal tubing connects this extremely useful instrument with the vacuum tank, through which it is operated.



Gasoline Dash Meter: On the Left is Shown How the Device is Connected to the Vacuum Tank and, on the Right, Is the Face of the Meter

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

Side-Worn Shoe Heels are Prevented by This Contrivance of Rubber and Leather, Which is Designed to be Glued inside Footwear. The Appliance Also Acts as a Cushion

Thread can be Unwound without Tangling or Waste When This Simple Device, Made of Spring Steel, is Placed on a Spool. At One End of the Clip Is a Cutter. The Contrivance Adjusts Automatically to Any Size Spool

A Deodorizer Which does Not Look the Part: After Water is Poured into the Graceful Vase, the Vessel Emits a Pleasing Perfume That Scents the Air in a Large Room

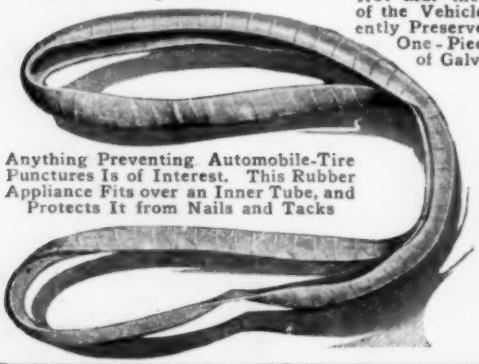
Perfect Fitting Is Possible with This New Gaiter, Which Has both Buttons and Laces

Cooking over an Open Fire Is Not Difficult with This Umbrellalike Device, Which Includes an Adjustable Tripod, Supporting a Revolving Grate. It Folds into a Small Package, and can be Used on Uneven Ground

Food Placed in This Aluminum Container Remains Hot or Cold for Hours, as the Device is Thoroughly Insulated, Though Not Bulky nor Heavy

A Departure from the Conventional Tea Ball Is in the Form of a Miniature Gold-plated Kettle, Provided with a Stand and Tray to Match

Strapped to the Running Board of a Touring Car, This Neat Refrigerator does Not Mar the Appearance of the Vehicle, but Efficiently Preserves Food. Its One-Piece Lining Is of Galvanized Metal

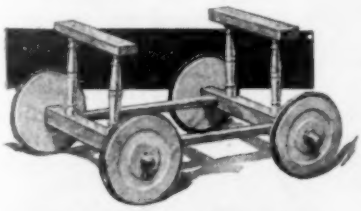


Anything Preventing Automobile-Tire Punctures Is of Interest. This Rubber Appliance Fits over an Inner Tube, and Protects It from Nails and Tacks

Pivoted Front Wheels Distinguish This Perambulator from Its Predecessors. This Construction Makes It Possible to Turn the Buggy Quickly without the Usual Laborious Manipulation, and without Disturbing the Infant Occupant of the Vehicle

Designed Especially for Home Lighting, a New Gas-Filled Electric Bulb is Made from Translucent Glass, Which Effectively Absorbs the Glare, without Materially Reducing the Illuminating Power of the Lamp. The Novelty Is Pear-Shaped and Has No Unsightly Tip. Made in 50-Watt Size Only

An Artistic Addition to Any Home Is a Wicker Birdcage Stand, on Which are Suspended Two Cages of the Same Material



When the Basket Shown on the Right is Placed on This Wooden-Wheeled Truck, It Becomes a Cradle That can be Moved Easily to Any Part of the House

Indoors or Outdoors, This Novel Wicker Bassinette Serves Baby. It is Equipped with Handles, by Which It can be Carried on the Street by Mother or Nurse. At Home, the Bed Rests on the Running Gear Pictured at the Left

Sectional Cedar Chest: New Parts can be Added When Required, and Any One of the Sections can be Opened without Disturbing the Contents of the Others

A New All-Steel Table for Campers and Tourists Folds into Remarkably Small Dimensions, and Is Not Heavy to Carry

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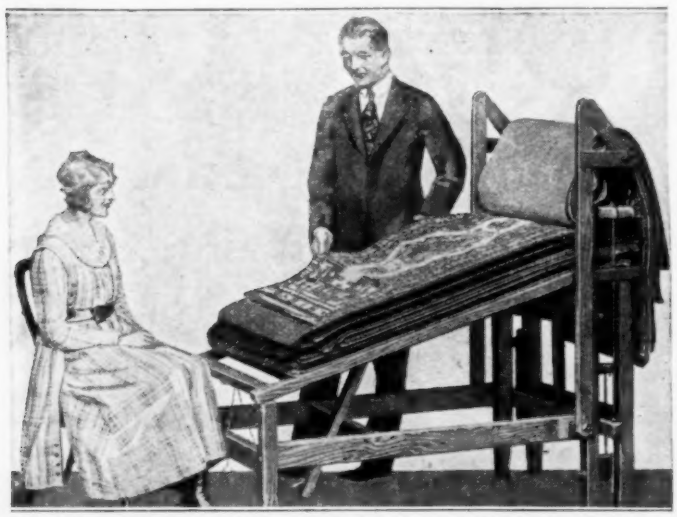
RACK FOR DISPLAYING RUGS KEEPS STOCK IN ORDER

Showing rugs to customers in retail stores requires less effort on the part of salesmen with a recently devised rack,



Rug-Display Rack: To Rearrange the Stock, the Side Levers, Which are Connected by a Crossbar, are Pulled toward the Inclined Table. The Clamp can be Loosened by a Simple Operation

which permits a large collection to be displayed in a brief time, and the rearrangement of the stock in an instant. The floor coverings are spread on an inclined table, at the upper end of which they are held in a clamp. When lifted and thrown back, the strips of carpet drape over a crossbar between two levers that are pivoted near the bottom of the rack on either side. By pulling the levers toward the table, the rugs are replaced in their former position.

WEAR ON RIGHT SIDE OF ROAD POINTS MORAL FOR DRIVERS

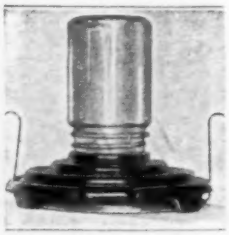
That increased traction means increased road wear, even with rubber tires, is demonstrated by the scars on the right side of every uphill road, where ascending wheels bite the surface. Pitting on the outer edges of crowned roads also shows the added traction caused by the sloping vehicle's weight being shifted to the right. Modern hard roads need little crowning, but in any event the driver can help maintain the pavement by refraining from tracking or driving in ruts, and keeping wherever possible to the center of the highway. A little thoughtfulness will keep down the taxes.

FAST-GROWING BLACK WALNUT MAY REPLACE LOST WOOD

Much has been said of late about the value of American black walnut, and its close approach to extinction. No doubt many trees are being planted now, and the next generation will gather huge profits from nuts as well as timber. The successful cultivation of a new crossed species, however, has now produced a tree that grows with extraordinary rapidity. This hybrid variety adds nearly a one-inch ring to its thickness every year. The first experimental specimen, now only 22 years old, is 96 ft. high, spreads 64 ft., and is 9 ft. 3 in. around the trunk. The nuts are much larger than the ordinary variety, and the wood is exceptionally hard and beautiful. Planting a grove of such trees would seem to offer a sure way to fortune in 10 to 20 years; but many will be interested in starting, perhaps, a single specimen of the new walnut, whose value in a few years would reach several hundred dollars, to say nothing of its great beauty.

INSECTS DRIVEN INTO TRAP BY RAISING BAIT PAN

Flies are stampeded into a recently invented insect trap by lifting the shallow bait pan, placed underneath a base that holds an inverted bottle or jar, when a swarm of the pests has gathered on the lure. Hook-like wire handles, attached to the edges of the pan, are provided for facilitating this operation. A small hole in the center of the base permits the frightened quarry to enter the upturned vessel above. Containers of various mouth diameters can be supported by the base. An ordinary glass fruit jar with which we are all familiar, is suitable for use with the trap.

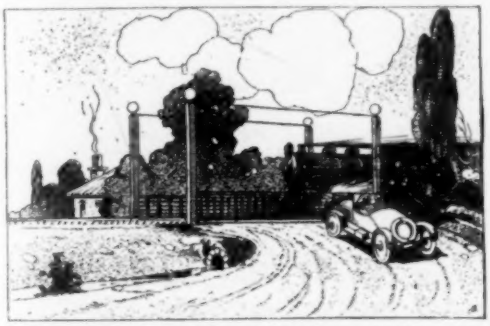


OPERA BY RADIO IS NOVELTY OF ELECTRIC EXPOSITION

A wireless-telephone receiver in the Signal Corps booth, from which issued the strains of familiar grand-opera selections, was a striking novelty of Chicago's recent electrical show. The music was transmitted from a station about a mile distant, a phonograph supplying the airs. That the clearness and strength of the transmission were not dependent on the short range, became evident when the radio operators at Ludington, Mich., and Milwaukee, Wis., sent thanks for the entertainment thus furnished them.

SPRING GATE CLOSES ROAD AT RAILROAD CROSSING

To reduce the too-heavy toll of accidents at railroad crossings which are not guarded by gatemen, a western inventor has developed a set of gates made of heavy woven wire, which automatically drop across the road on either side of

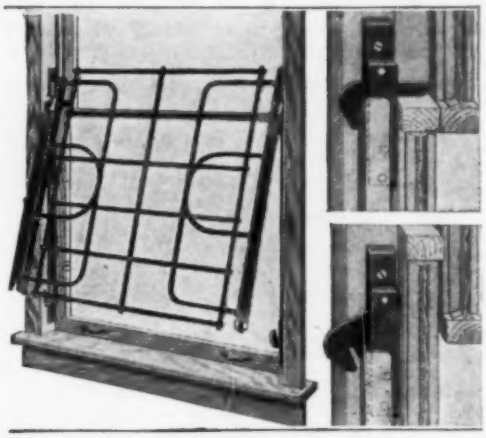


Spring Gates, for Railroad Crossings, Which Drop across the Road While the Lamps on the Posts Light Up

the tracks, when a train approaches. The gates slide in posts, capped with red lights; a warning bell, also, is provided. A single electric motor drops and raises the gates. They are spring-suspended in such a way that an auto running into them carelessly, would be little damaged.

REMOVABLE WINDOW GRATING LOCKED BY RAISING SASH

As a substitute for unsightly and inconvenient iron bars, a window guard that is locked in position when a lower sash is opened, but which can be removed easily when the latter is closed, has appeared on the market. The device includes a metal grating, adjustable as to width, and intended to be installed by placing it in holders attached to the sides of a window casing. Near the upper ends of the holders are the locks, which

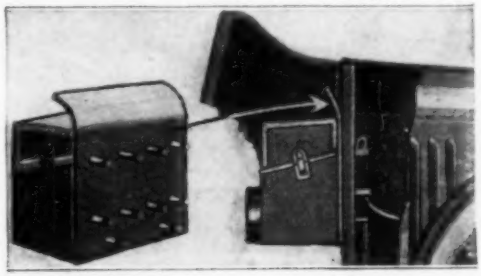


Window Guard: On the Left the Device is Installed. The Operation of the Automatic Locks is Illustrated at the Right of the Picture

consist of hooks, so arranged that they are pushed into notches in the side strips of the grating by raising the lower sash.

AUTOMOBILE IGNITION SYSTEM PROTECTED BY NEW DEVICE

Water entering a crack between the cowl and hood of a certain make of inexpensive motor car often causes short circuits of the ignition system by soaking the wooden back of the box which contains the induction coils. A simple device for the prevention of this trouble is now on the market. It is a sheet of rubber, prepared to withstand the action of heat and moisture, and designed to be placed between the coil box and the instrument

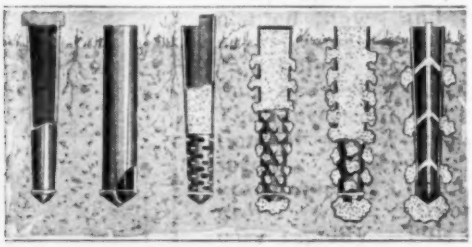


A Rubber Shield in Front of a Coil Box Prevents Short Circuits Caused by the Entrance of Water

board, with its upper edge bent backward under the front of the cowl. The porcelain terminals pass through snugly fitting holes in the sheet.

PILING MADE IN MANY FORMS BY NEW CONCRETE PROCESS

A novel process of making concrete foundation piling in a variety of shapes, adaptable to any condition, has just been

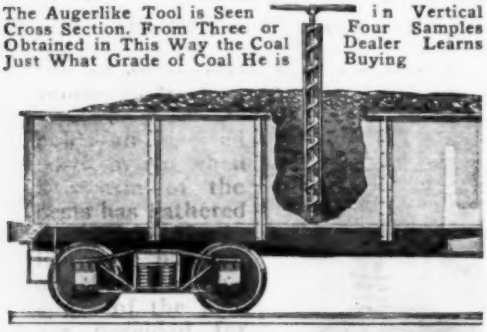


Views of Forms Used and Sections of Finished Piling, Giving a Clear Idea of Both Method and Results

announced. The form, placed in the ground, has a number of side openings, and its end piece is also perforated. A reinforcing tube inserted in the form has branches communicating with all of these openings. The concrete is poured, the form withdrawn, and reinforcing material is then forced through the tubes until it forms projections at the outside of each opening. The size, number and shape of the openings may be varied as desired.

SPIRAL TOOL DRAWS SAMPLES FROM CARLOAD OF COAL

To extract testing samples from a carload of coal there is now produced a

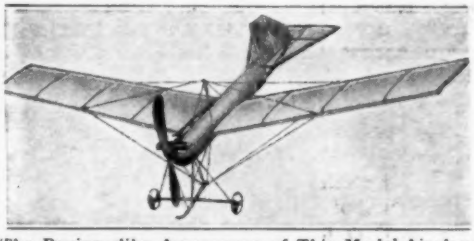


The Augerlike Tool is Seen in Vertical Cross Section. From Three or Four Samples Obtained in This Way the Coal Dealer Learns Just What Grade of Coal He is Buying

tool that does the work thoroughly and quickly. In appearance it resembles a large auger with its spiral inclosed in a steel pipe. To extract his testing sample, the coal dealer's representative twists the auger handle until the point encounters the car bottom. He then pulls the sampler from the coal, and reverses the spiral. This motion permits the extracted coal to fall into a suitable receptacle. Teeth at the bottom of the pipe keep it from turning, and act with the auger end to shear off lumps of coal that wedge between.

STURDY LITTLE AIR MOTOR DRIVES MODEL PLANE

As their big brothers enlisted in the fighting air services thousands of boys on both sides of the Atlantic found a new, or an added, interest in flying model airplanes. The sport now boasts more youthful enthusiasts than ever before. Many of the boys build their own craft; yet manufactured models find a ready market. An efficient and reliable machine, powered with a compressed-air motor, is now produced by an English firm. It is of the monoplane type, with a wing span of 5 ft. 9 in., and a length of 3 ft. 6 in. The fuselage is replaced



The Businesslike Appearance of This Model Airplane will Recommend It to the Youthful Enthusiast. The Twin Cylinders of the Compressed-Air Motor Turn an 18-Inch Propeller

by a cylindrical tank containing air at 150-lb. pressure. Fixed to the forward end is the little two-cylinder engine with its 18-in. propeller. The total weight is only 28 ounces.

SCALP CUT TO TIGHTEN FACE AND REMOVE WRINKLES

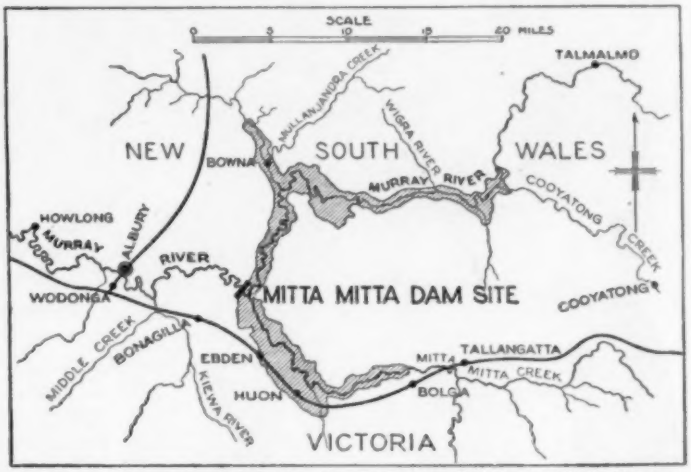
A surgical cure for wrinkles is an unexpected but wholly practical result of war-time reconstruction work on shell-torn faces. The advocate of this new form of "cosmetic" surgery, a Frenchman, observed that wrinkles and folds vanished from the face when the skin before and above the ears was pulled upward and backward. He has accordingly devised an operation which consists in cutting a bit of skin from the scalp, then pulling the edges of the wound together with fine stitching. The skin of the face is drawn tight, and the wrinkles disappear. The scalp is chosen because the hair soon grows and hides the scar.

VAST IRRIGATION RESERVOIR PLANNED FOR AUSTRALIA

Thirty thousand acres of land will be submerged by the construction of a mammoth dam in southeastern Australia, the object of which is to form a great irrigation reservoir. Work has started on the structure, which will be located on the Murray River, a short distance below the confluence of Mitta Mitta Creek with that river. It is estimated that the project will cost $8,000,000 to complete. Approximately 43,560,000,000 cu. ft. of water will be impounded.

The total length of the dam will be 3,601 ft. This will comprise three sections: an earthen dam, 2,700 ft. long; a concrete spillway, 740 ft. long, and an outlet works of the same material, 161 ft. long. At some points the dam will be nearly 100 ft. in height. The foundation will extend down to a stratum of granite, 34 ft. below the surface of the earth.

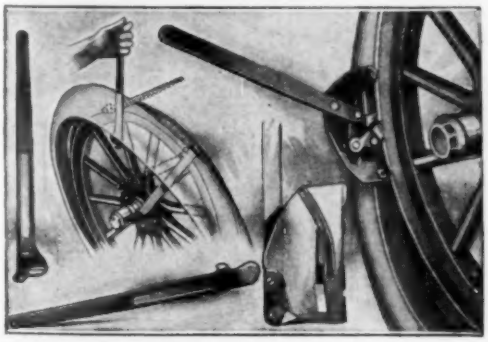
Only a comparatively small portion of the dam will be situated in the river bed proper, as the greater part will extend across an alluvial flat on the left bank of the stream. In constructing the earthen dam, a concrete core wall will be built, and covered with stone to reinforce the dirt embankment. Thirty-one sluice gates will be installed in the spillway section. Water turbines, placed in the dam, will furnish power to operate these. The outlet works will be pierced by eight 6-ft. pipes, equipped with valves and capable of discharging 8,000 cu. ft. of water a second under a 29-ft. head.



Location of the Great Australian Dam: The Shaded Area will be Covered with Water When the Project is Completed. Many Acres of Land will be Irrigated by Means of the Big Reservoir

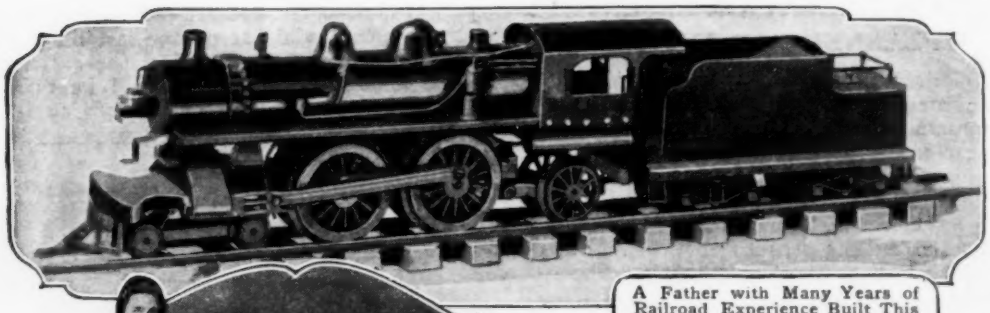
TIRE TOOL QUICKLY PUTS ON CLINCHER TIRES

The occasional obstinacy of the ordinary clincher tire is a sore point with many motorists. To put one on with ordinary methods not infrequently results in injuries to tire and tube, not to mention fingers and temper. A simple tool is now produced, however, with which the operation is performed quickly and safely. With the clips of the instrument embracing the rim, the tire is laid so that the outer bead is flush against a curved guide. Then, as the lever is worked back and forth like a pump handle, a reciprocating dog pushes the tool around the rim and slides the tire into place. Incidentally, the beads are always forced together ahead of the tool, so the inner tube is never "pinched," and injury to it is impossible. For removing the tire two other simpler tools do the work in a few seconds.



At the Right are Shown Front and Rear Views of the Tool Which Puts On the Stiffest Clincher Tire in a Few Seconds. Removal Is Equally Easy When the Bars at the Left are Used as Indicated

¶In Japan, auto speed limits depend on the width of the road. Streets over 36 ft. wide permit 16 miles an hour; between 18 and 36 ft. wide, a 12-mile gait is the limit, while on country roads, 12 to 18 ft. across, an eight-mile pace is set.



A Father with Many Years of Railroad Experience Built This Toy Locomotive for His Little Son. Engine and Tender Together Are About Two Feet Long. A Spring Motor in the Boiler Turns the Wheels, While a Battery Supplies Current to the Headlight

As Part of Its Public-School System, Chicago Possesses One of the Best Schools for Cripples in the World. The Institution's Equipment Includes This Wheeled Frame, with Which Many Unfortunates have Learned to Walk. It was Constructed in the School's Manual-Training Room

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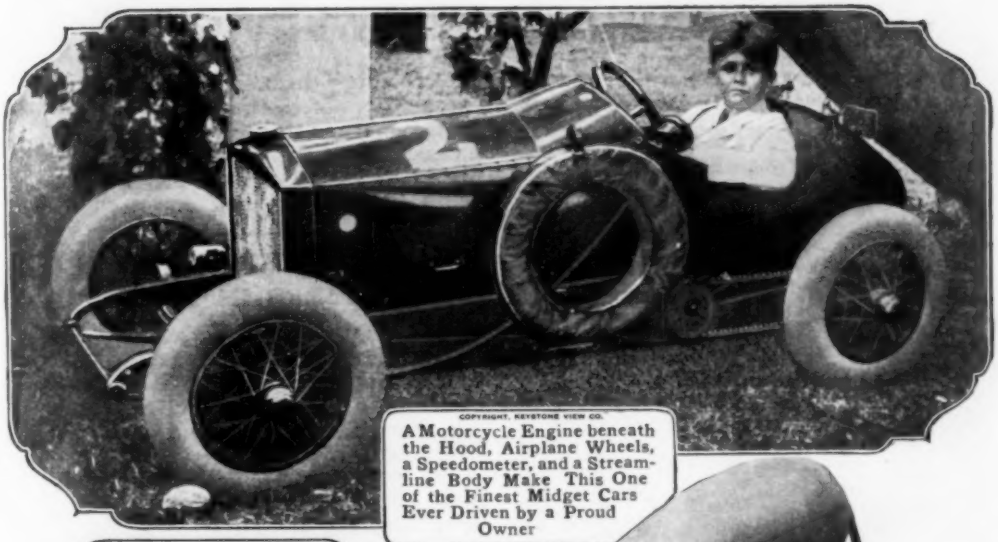
Near-By Parks and Farms Are the Classrooms Now Used by the Nature-Study Classes of a Primary School near Philadelphia. A Live Sheep Gets More Attention Than a Dead Book



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A Motorcycle Engine beneath the Hood, Airplane Wheels, a Speedometer, and a Streamline Body Make This One of the Finest Midget Cars Ever Driven by a Proud Owner

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Toy Airplanes Are Common, but This Is One of the First Genuine Toy Balloons. It Resembles the Bags Which Hold a Military Observer High above the Battle Line

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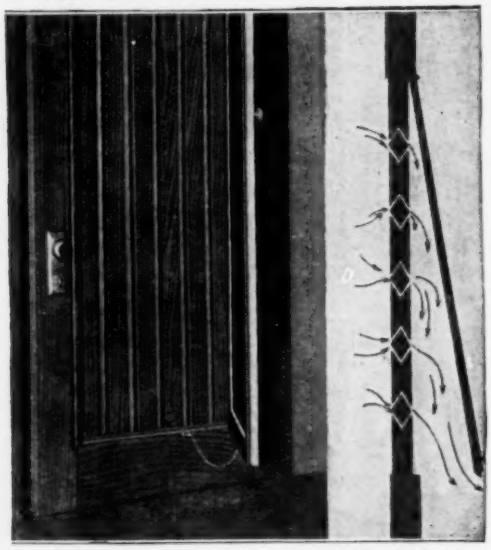
Coasting Downhill Is True Sport When the Skater Provides Himself with This Accessory. Sitting on the Saddle with the Crosspiece Resting on His Legs, Just above the Knees, the Coaster Finds Himself Busy Keeping His Balance

The Clockwork Machine Shown at Left and Right Holds the Doll Erect, While a Wheel Pushes It along the Floor, and Reciprocating Arms Cause the Feet to Move as in Walking

DOORS PERMIT VENTILATION WHILE GIVING PRIVACY

Doors that give privacy without interfering with the passage of air when closed



A View of the Inside of the Ventilated Door is Shown on the Left. At the Right Is a Section, Indicating Its Construction

are provided for the guest rooms of an Iowa hotel. The panels of the doors are composed of vertical strips of two sizes, the larger about 3 in. wide and ¾ in. thick, and the smaller 1 in. square. Along the edges of the former there are V-shaped grooves, running the entire length of the board. The smaller strips are set between the larger, with two angles fitting into the grooves, and a space of ¼ in. separating them. Air can pass through these interstices, though the door presents a barrier to the eye. A solid panel hinged to the inside of the door can be closed to make the latter tight, when ventilation is not wanted.

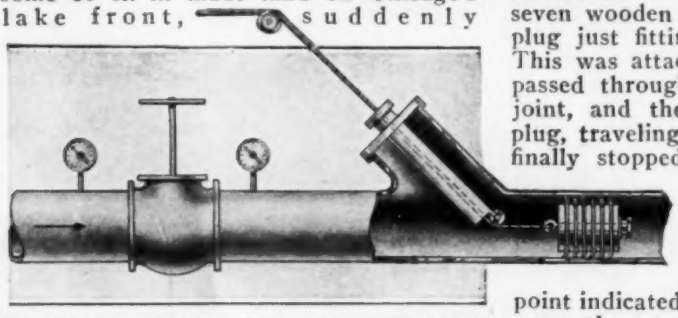
PREHISTORIC STONE STRUCTURE UNCOVERED IN COLORADO

Picturesquely situated in the Mesa Verde National Park of Colorado has been found an old Indian relic, declared to be the highest stone building built by the aborigines before the coming of the white man, of which any trace has been found north of Mexico. The tower is some 40 ft. high and rises from a considerable structure, 136 ft. in length. Remnants of the original rafters are still in place, and even show marks of the crude stone implements used by the builders. This latest find, with the houses and cliff dwellings already excavated and restored, makes Mesa Verde a remarkable natural museum, where aboriginal life may be studied under almost ideal conditions.

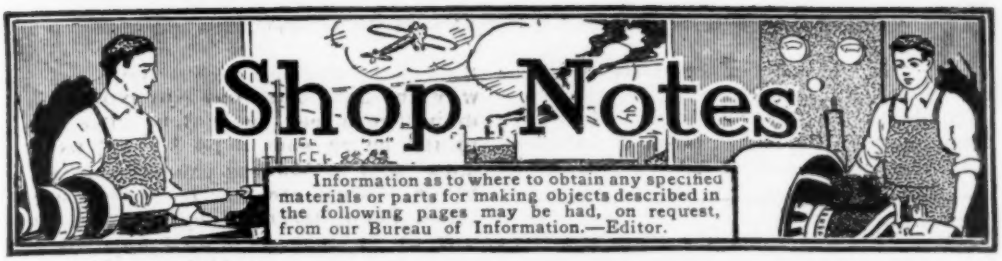
¶Postage stamps of triangular form have been issued by the new People's Republic of the Ukraine in Europe. The shape is symbolical of the Holy Trinity, representing the ascendancy of Christianity over Mohammedanism.

TRAVELING PLUG FINDS LEAK IN LONG-BURIED PIPE

A section of 6-in. water main, buried some 36 ft. in made land on Chicago's lake front, suddenly sprung badly aleak a short time ago, and the only clew to the location of the break was that the leakage occurred between two valves, 830 ft. apart. After several unsuccessful experiments, an ingenious plan was put into operation. Six rings of rubber steam packing, clamped between seven wooden disks, were formed into a plug just fitting the inside of the pipe. This was attached to a 5/16-in. wire rope passed through a stuffing box on a Y-joint, and the water turned on. The plug, traveling about two feet a second, finally stopped 616 ft. 3 in. away, and the gauge pressure fell to three pounds, with a full head of water passing through the pipe. Excavation was made at the point indicated, and the break—a one-inch separation caused by the settling of the ground—appeared just where the plug had ceased its journey. The repair was then made quickly and at low cost.



Traveling Plug That Found the Leak, and Method of Introducing It into the Pipe through a Stuffing Box


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Combination Chair and Folding Bed

By F. E. LEITCH

AT times, in nearly every home, there is an urgent need for the temporary use of a single bed or cot that can be moved about easily. And as living quarters, in cities especially, seem to be growing smaller every year, few families care to use much space for furniture that is not used constantly.

This device, which quickly converts an ordinary morris chair into a temporary bed, or couch, without the expense of a mattress, can be constructed at little cost by one who enjoys working with tools. The wooden framework, which folds and fits under the seat cushion of the chair, is shown in Fig. 1, both folded and opened out. Two steel hooks are provided, by which the extension is attached to the chair when in use. In Fig. 2, is shown the general appearance of the couch, and also a sectional view of the device when folded and placed under the seat cushion. As may be seen in this

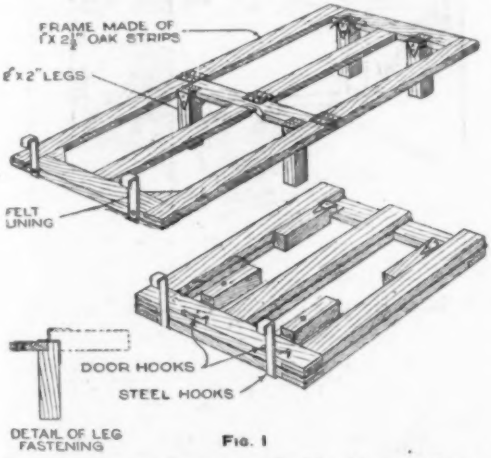
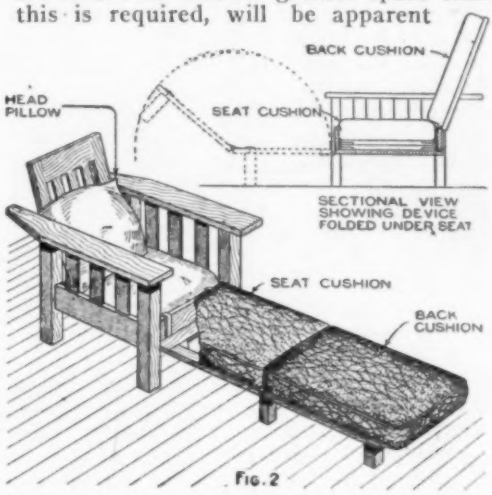


FIG. 1

Details of the Couch Frame: By Mortising the Legs, the Frame Folds Up So As to Occupy But Little Vertical Space

view, the steel hooks fit between the cushions at the back, so that they take up no room. The entire height of the frame, when folded, is only 2 in.—the thickness of the legs. How the frames are folded so that no greater space than this is required, will be apparent



General Appearance of the Couch When Set Up: A Sectional View is also Given Which Illustrates the Two Positions of the Frame

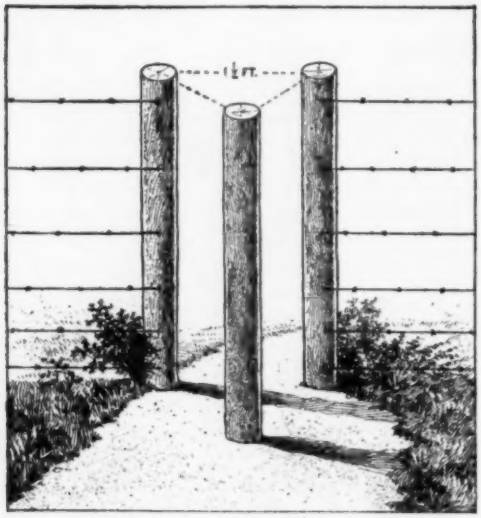
from a study of Fig. 1, which shows two views of it.

To convert the chair into a couch, first remove the seat and back cushions, lift out the folded frame, and hang the two steel hooks over the front of the chair, as in Fig. 2. Then unfold the lower section; the legs will swing down into place, and are fastened by the door hooks seen in Fig. 1. Place the seat cushion on the middle section, and the back cushion on the one at the foot. Fill in the seat of the chair with sofa cushions, and place the head pillow on top. A very comfortable couch is thus produced, which may be over 6 ft. in length. The foot cushion may be tied on, if there is any danger of the sleeper's pushing it off.

In constructing the apparatus, be sure that the legs are hinged so that when they are folded, they will not interfere with each other. The legs are mortised at the top, to fit just inside the frame strips.

Stock-Proof Farm Gate

A short-cut path across a field to an electric car line was blocked by the owner, who fenced it with wire and



To Enable Pedestrians to Pass through a Field without Danger of Cattle Escaping, a Gate was Built of Three Posts

turned cattle in to graze. Since the path saved a great many steps, he received many protests. The owner gave permission to the pedestrians to put in a gate at each end of the path that would permit them to pass, but prevent the escape of cattle. This was done in the manner illustrated.

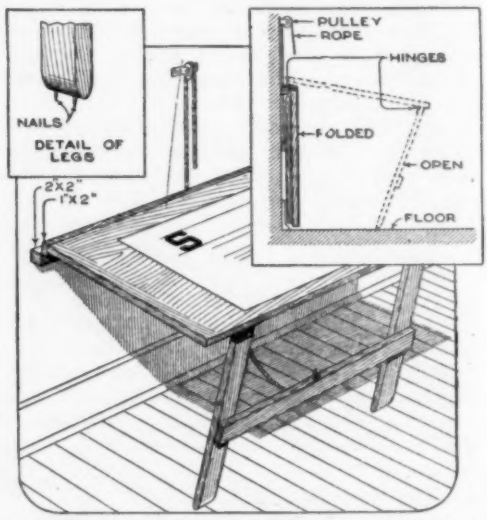
An opening was cut in the fence, 1½ ft. wide, a post placed on each side, and a third post midway between them, about 1½ ft. from the fence line. The arrangement proved to be quite satisfactory.—Werner W. Baumeister, Walla Walla, Washington.

Collapsible Show-Card Desk

The show-card bench described will prove of great value in the sign shop where space is not very plentiful. It can be folded up against the wall, out of the way, when not in use. Another good feature is that when lettering a large oilcloth or a large sign, the bench can be lowered for working on the top line, then gradually raised until the last line is reached.

It will be easier to put the bench together before attaching it to the wall. Make it any length desired, putting battens on the underside. Then fasten the 2 by 1-in. stringer with screws, and attach the 2 by 2-in. piece to it by means of hinges placed every 3 ft. The width of the bench should be 3 ft. The legs must be 4 in. shorter than the width of bench. They are to be hinged to the bench itself, far enough away from the battens so as to fold up compactly. A hole, or notch, should be made in the 2 by 2-in. piece, to pass the rope through. If the bench is to be attached to a plastered wall, find the uprights back of the plaster, and fasten the 2 by 2-in. strip to the wall with 4-in. bolts, or screws, using washers. At the bottom of the legs, drive 1-in. wire nails, permitting ¼ in. to extend. Cut off the heads; this prevents the legs from slipping on the floor. Before setting the bench in place, close it and place it against the wall, letting its outer edge touch the floor. Make a pencil mark on the wall above the strip, so that the bench will not be fastened too low to fold against the wall.

To raise the bench, simply lift it with the hand. To lower, or fold it away,



A Bench Made in This Way Takes Up Scarcely Any Room at All When Not Required, but Is Instantly Available When Lifted Up with the Hand

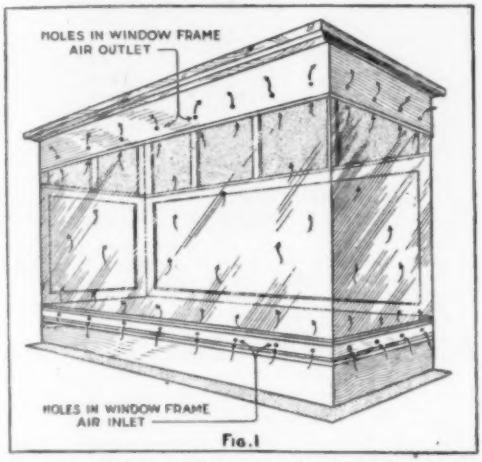
raise it slightly, pull on the rope that has been passed through the pulley above the bench, and let the bench down gently. —Arthur J. Kelly, Brooklyn, N. Y.

¶ Auto tops which are left down most of the time soon have holes worn in them. They may be easily repaired by the use of the ordinary cementless rubber patches used to repair inner tubes.

Prevention of Frost on Show Windows

By G. E. SAMPSON

WHAT would otherwise be a good window display is often rendered ineffective by frost. This happens when the temperature inside the window is higher than outside. When this is true, the moisture of the inside air condenses



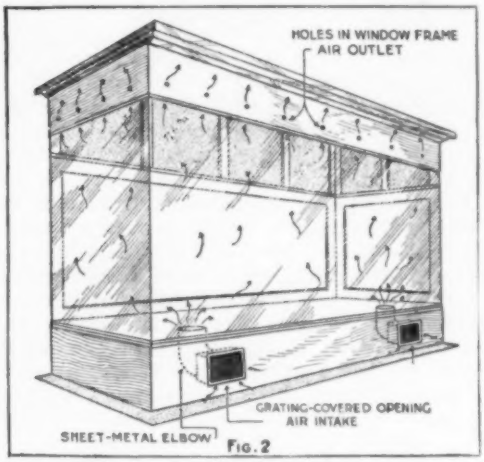
When the Window Glass is Set in a Wooden Frame Which Extends above the Window Floor, All the Holes Required may be Made in This Frame

on the panes, and forms a thin film of ice. Frosting of this kind can be eliminated easily. One way is to place an electric fan inside the window to throw a current of air against the glass. However, with this method, certain areas of the glass surface, not touched by the air current, are covered with frost, giving the window a spotted appearance.

The method described here is cheap and satisfactory. The underlying principle is to ventilate so that the inside and outside temperatures are nearly the same. With it, an inclosed background must be used. That is, the show window must be so modified that it is shut off from the remainder of the store by practically air-tight partitions. Thus the background must be built entirely to the ceiling, as shown in Figs. 1 and 2. In the upper part of the background, window glass can be placed so that light will be permitted to enter the store. Over the lower part of the background, which is built of matched tongue-and-groove stock, a layer of white muslin is pasted, and, for decorative purposes, this may be covered with colored crêpe paper, wall paper, or cloth. It may also be desirable to divide the background into panels with strips of wood. Then the panels may be tinted any color with a flat oil or water paint. The means which should be employed for providing ventilation will vary with the construction of the show window. Two general types may be encountered. In windows of the older designs (Fig. 1), the glass is set in a wooden frame. With the more modern buildings (Fig. 2), the glass frame does not extend above the floor of the window.

Where the window construction is that of Fig. 1, a number of ventilating holes, about ¾ in. or 1 in. in diameter, are bored, equidistantly spaced in the window frame, as illustrated. A corresponding number of holes is also cut through the upper frame. Thereby, ventilation will be established, as suggested in the diagram. Fine-mesh screen, similar to that used in the windows of sleeping cars, should be tacked over the holes inside of the window, to prevent the entrance of dust. During warm weather, battens should be nailed over the holes so as to stop them entirely.

Where the window construction is similar to that suggested in Fig. 2, ventilating ducts opening to the outside are provided. Through the top window frame ventilating holes are bored. The ducts can be assembled from stovepipe or hot-air furnace fittings. On the outside, the openings should be covered with gratings. Hot-air furnace register gratings will answer nicely. The openings in the window floor can be covered with fine-mesh netting or cheesecloth. In dressing the window, these openings should not be totally obstructed, because if they are, the window will frost in cold weather.



When the Lower Frame of the Window Does Not Extend above the Floor, Recourse must be Had to Two or Three Large Openings, Covered with Gratings

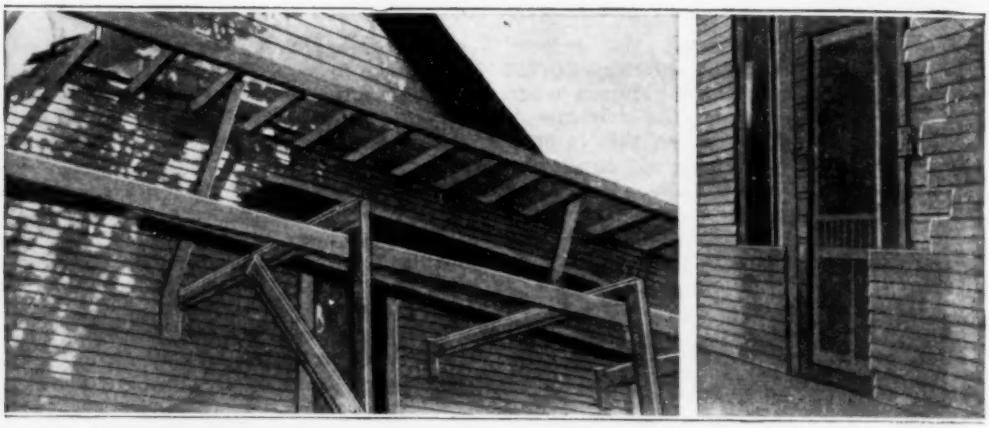


PHOTO COURTESY GROVER HOOVER

The Side View Shows the Narrow Weather Boards of the New Structure being Built a Few Inches Away from the Old One. The View of the Front Door Also Indicates the Small Space between the Two Walls, and the Necessity of Having the New Doors Correspond in Position to the Old Ones

Building a New House around the Old

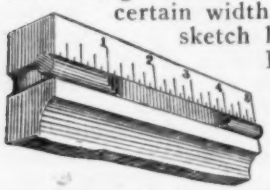
THE pictures show how a western man accomplished the rather unusual feat of building a new house on the same ground as the old one without first tearing down the latter. The new house was built all around the old one.

The owner, who was of course a professional builder of long experience, first proceeded to dig a trench close about all four sides of the foundation of the old bungalow. These were then filled with concrete, forming a complete new concrete foundation. The only part of the old house which was torn away before the outward portion of the new one was completed was the front porch. The builder then proceeded with the frame walls for the new structure, these being in some places as close as 3 in. to the old walls. As the walls neared the top, the main difficulty was encountered, for the new bungalow had been planned to have a gable roof built at a different direction from that of the old structure. To overcome this difficulty, holes were cut through the old roof for the new rafters, the holes being temporarily patched against the weather with tar paper. Then, as the new roof took form, the old one was gradually cut away. During this work the family occupied the old home as usual. When the outward structure of the new building was completed, two rooms were finished in the rear, which extended 20 ft. back from the old bungalow, and these served to house the occupants while the old house was torn down.

It may seem that a great amount of labor was wasted in working under such difficulties, but when it is considered that the amount saved in the labor of moving, and in keeping the floor coverings, carpets, and other articles intact, was estimated at over $1,500, it may be well understood that the owner looked upon the job as a great financial success.

Graduated Jaws for Milling Machines

It often occurs that the vise is used on the milling machine to mill a flat of a certain width, as shown in the sketch herewith.



By graduating one of the vise jaws in inches, the operator can immediately tell when he is right or wrong. Such a method does not spoil the vise jaw for use on other jobs.

Old License Plates Save Car Floor

It is a common thing to see two holes or ragged depressions in a car floor where the heels rest, just behind the clutch and brake pedals. Old license plates tacked over these places will reduce the wear on the floor, and yet provide adequate support. The rubber mat used on the floor may have a rectangular portion cut out just over this metal floor covering, thus protecting the mat from further wear in that spot, while still covering the rest of the floor.

Steel Wool for Cleaning Glass

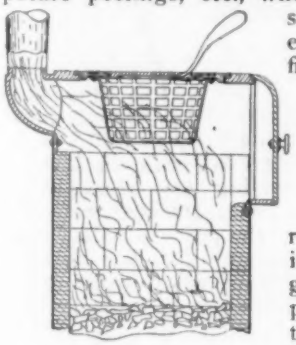
Lettering or paint on glass of a rough or curved surface is a difficult thing to clean off with either scraper or paint remover. A simple method is to shave off as much of the paint as possible with a razor blade, and then go over the remaining paint with the finest grade of steel wool. This will remove every trace of paint. There need be no fear of injuring the glass, as the steel wool can be used for glass polishing. Glass in skylights, that has become weather-stained through neglect for years, can be made as clean as new glass by rubbing with coarse steel wool, and then polishing with the finest wool.—Arthur J. Kelly, Brooklyn, New York.

Breast Drill Hung on Coat Hooks

The amateur mechanic generally hangs his tools on the wall by screw eyes, nails, etc., but when he tries the method with a breast drill, he finds that none of these will hold it. If two coat hooks are set in the wall, about 2 in. apart, the drill will hang straight and secure on them.

Burning Garbage in the Stove

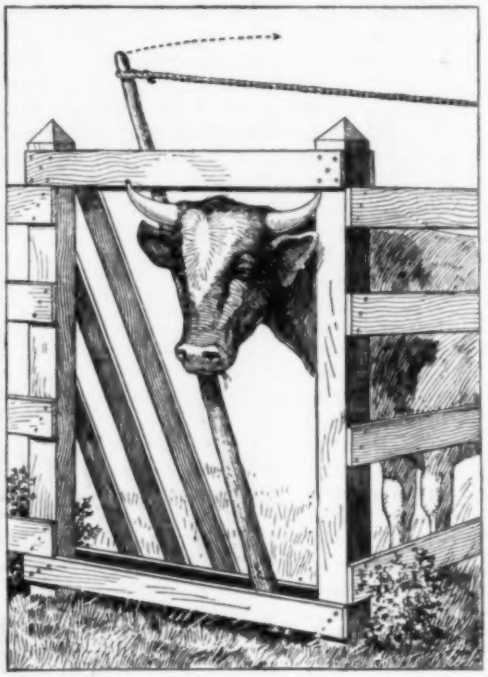
Garbage which collects in the household, consisting sometimes of vegetables, potato peelings, etc., when thrown in a stove has a tendency to put the fire out, or at least to interfere with its heat. A better method is to build a receptacle in the roof of the stove, in which the garbage may be placed. It will then be dried out by the heat of the fire without damaging the fire in the least, and will afterward catch fire and burn itself.



An old pan is first secured, and holes of ample size cut all over it. By means of small flanges it is bolted to the outer rim of the lid. In this way the damp rubbish can be placed in the pan by lifting off the small center lid. When the garbage has been consumed, the ashes filter through the openings and are removed with the coal ashes.—J. H. Rodgers, Montreal, Can.

Cattle Holder for Dehorning

A lock gate for catching and holding cattle while they are being dehorned and marked, is simple in construction.



A Gate, Rigged Up So as to Leave Only an Opening Big Enough for a Steer's Head, Is Useful When the Animal is to be Marked or Dehorned

First make a gateway in the lot fence, using not less than 4-in. material for the gateposts. Now nail a 6-in. board on each side of these posts, across the gate at the ground, and also two others across at the top of the posts. Close up half of the opening by nailing boards diagonally to the boards at top and bottom of the posts, as illustrated. Get a strong pole, about 4 in. in diameter and 12 ft. long. Bore a hole through its large end with a 1-in. auger; also bore through the bottom boards, about 8 or 10 in. from the post at the open side of the gate. Let the pole down between the top boards and the bottom ones, and insert a 1-in. rod through the bottom boards and the pole. Then tie a 1-in. rope to the top end of the pole.

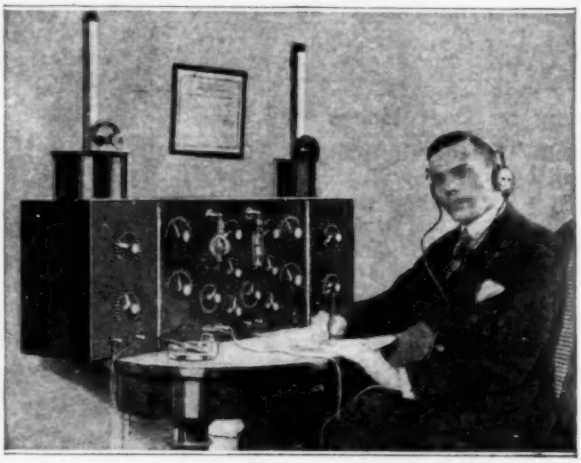
When ready to dehorn or mark a large strong animal, drive him toward the gate. Just as he passes his head by the pole, pull it over against his neck, and he is easily held. There is no danger of his doing damage with his horns, for he cannot move his head.

A Practical Radio Arc-and-Spark Receiving Cabinet

By FRANK L. BRITTIN

THE question of buying or making a wireless receiving set is uppermost in the minds of thousands of amateurs today, since the government has removed war-time restrictions on receiving radio messages.

The war has broadened the radio field to a really remarkable degree. The amateur now wants a receiving cabinet that will enable him to receive from the powerful arc stations of Europe, as well as from both arc and spark stations of this country. Receiving apparatus that has to be scattered all over a large table is obsolete; the modern receiving cabinet is a thing of beauty, an ornament to the home. The one here described meets the desire of the most advanced amateur. Set up in Illinois, it is sensitive to the long-wave or arc signals from IDO (Rome, Italy), POZ (Nauen, Germany), YN (Lyons, France), and other European stations, as well as the large stations of America. The aerial used is a single 160-ft. wire, on the roof of a three-story building.



Taking Up Only a Small Amount of Space in the Corner of the Room, the Cabinet Is an Inconspicuous Article of Furniture, and If Properly Finished, may Be a Real Ornament

The cabinet is constructed of ½-in. birch, or mahogany, and is 14½ in. high, 41½ in. long, and 9 in. deep. It is divided into three sections. The front of the cabinet is of ¼-in. polished hard rubber, in three separate panels.

Before drilling these panels, a template of heavy cardboard should be made for each, and the scales for the condensers and rheostats scribed on the polished hard rubber, which is then marked for drilling. Fig. 1 shows the middle, or control, panel; and on this are mounted the battery controls for the "A" and "B" batteries, so-called. (The "A" battery is the storage battery which furnishes the filament current, while the "B" battery furnishes potential to the plate circuit.) The mounting for the bulbs may also be fitted to receive any type of audion bulb. At C1, C2, C3, and C4 are shown the positions of the variable condensers for the arc circuit. R1 is the rheostat for the arc-receiver bulb, the bulb being placed directly above it. Double binding posts are used for the phones, so that more than one pair of phones can be connected when desired. The "A" battery, which is a six-volt, 40 to 80-amp.-hr., automobile-type storage battery, is used to provide the filament lighting for both bulbs.

At R2 is shown the rheostat for the spark-receiving circuit, and the bulb for it is placed above. The "B" battery controls are shown at B1, for the arc side, and at B2, for the spark. Ten three-cell flat-type flashlight batteries provide the plate voltage for the arc circuit, and ten for the spark. The "B" batteries are placed in two banks of 10, each bank connected in series. A lead is taken from the negative side of each of the first nine batteries to the upper control rheostat, and the last tap is left dead, as an "off" point.

The tenth battery of each bank must be opened, the sealing wax carefully removed, a lead taken from each cell and brought to one of the points of the lower four-point switch, for the fine adjustment; thus any number of cells up to 30 can be connected in, as needed. All leads from "B" batteries to taps should be placed in the proper position, as shown in the photo, and a thin strip of wood should be screwed to the top of the cabinet to hold them in place. This allows for the renewing of the "B" batteries without disturbing the arrangement of the leads. The "B" batteries for both arc and spark are connected in the same manner. All connections are carefully soldered. Two telephone-jack switches of the three-way type are used to throw the receiving circuit from the arc to the spark, and vice versa; if such jacks are not readily procured, or-

dinary double-pole, double-throw knife switches can be substituted.

At each side of the central panel is a smaller one. The one at the left carries the control for the long-wave primary; below it are the two binding posts for connecting the "A" battery. The right panel carries the short-wave primary control; the posts below it are to provide for an additional variable condenser, to be placed across the secondary of the short-wave coupler, if so desired. These panels are mounted flush with the face of the cabinet, a ¼-in. rabbet being cut to permit this construction. The joining edges of the panels are covered with a thin narrow strip of nickeled brass, screwed into the dividing partitions of the cabinet. The back of the cabinet is of beaver board, in three sections, like the front panel, allowing easy access to the circuits.

The "A" battery rheostats, R1 and R2, are of the back-mounted type, and are screwed to the back of the control panel. The condensers are mounted in the same manner.

Condensers C1 and C2 are 23-plate variables, and condenser C3 is a small-capacity five-plate variable, placed across the long-wave secondary. C4 is connected across the phones and consists of 43 plates. This comprises all the condensers in the long-wave receiving circuit in the electrical diagram, Fig. 2.

These condensers must be carefully constructed and mounted in correct alinement, with a calibrated scale on the front of the panel. The scales are scribed

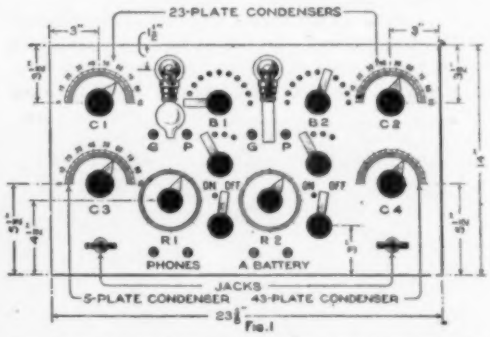


Fig. 1

The Face of the Central Panel is Here Represented, with the Symbols and Dimensions Marked upon It

into the panel with an engraving tool, and jeweler's wax is rubbed into them, giving a clear, sharp detail.

The primary of the long-wave coupler is 7½ by 13 in., and is wound with No. 30 double cotton-covered wire. The secondary is 6¾ by 12 in., and is wound with No. 32 double silk-covered wire. Both the primary and secondary are wound on heavy cardboard tubing, and are tapped off in the usual manner.

The primary of the short-wave coupler is 5 by 10 in., and is wound with No. 22 double cotton-covered wire; the secondary is 4¼ by 8½ in., and wound with No. 28 double silk-covered wire. The primary tube is 13 in. long, but only wound for 10 in. of its length, as this provides

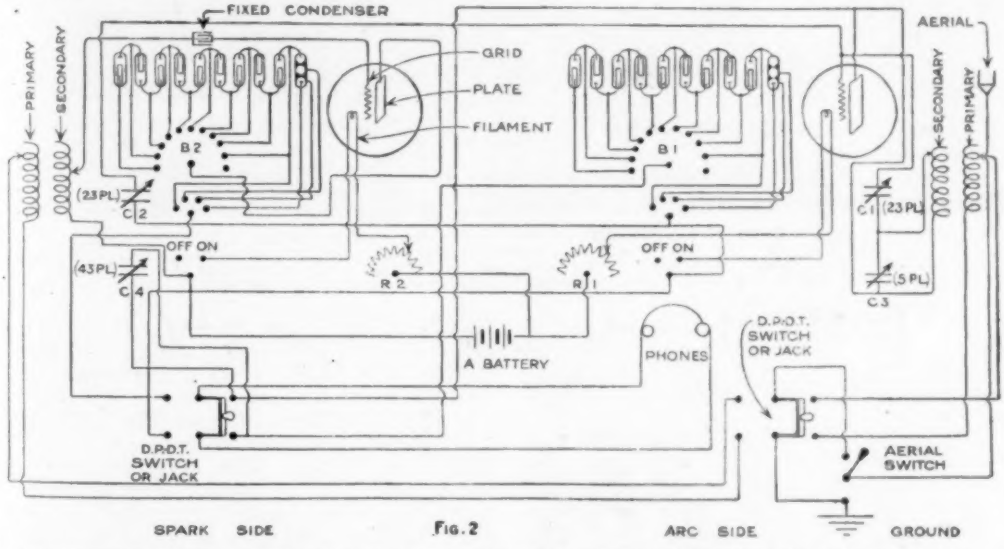


Fig. 2

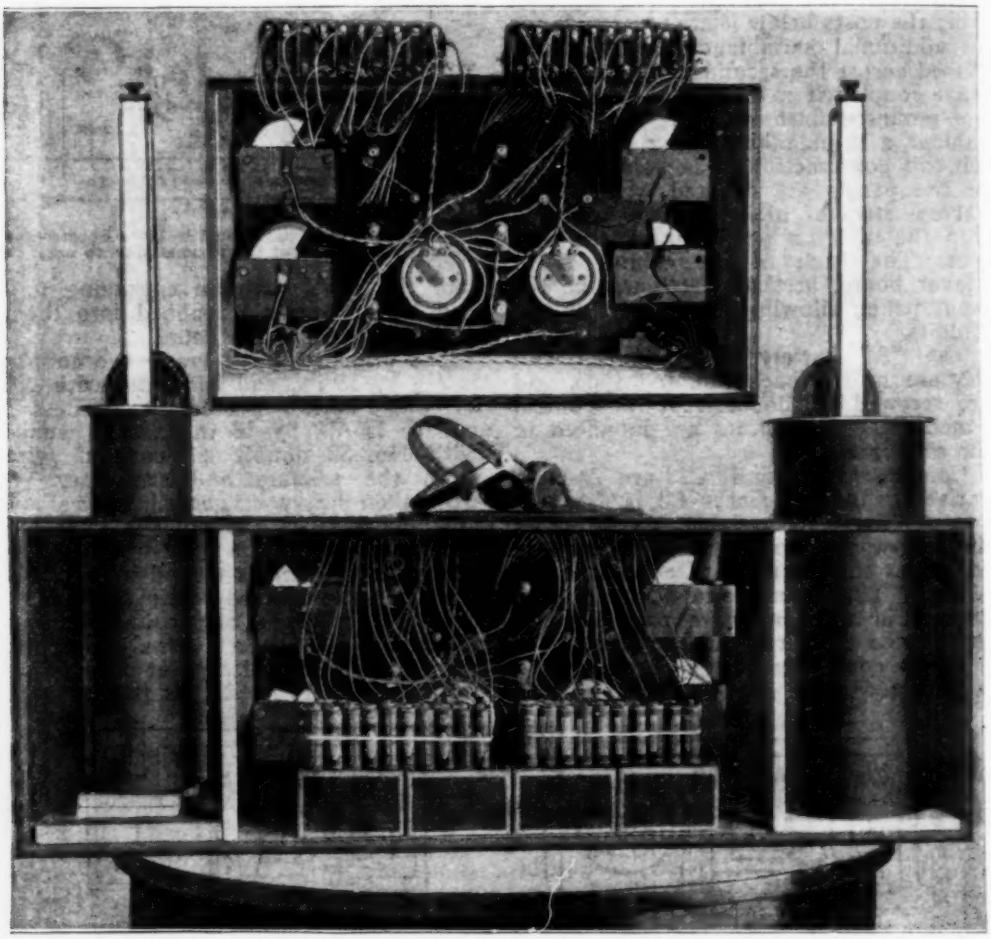
The Complete Diagram of Electrical Circuits: The Spark Circuits are Grouped at the Left, and the Arc Circuits at the Right. The Two Circuits Interlock, However, at a Number of Different Points

all necessary inductance. The leads from each secondary to the circuit are brought out through its base.

Figure 3 shows the top of the cabinet, with holes cut to take the secondaries of both couplers. The tops of both secondaries are fitted with hard-rubber caps, as shown in Fig. 4, their edges acting as dust-proof covers. The controls for each secondary are mounted upright on hard rubber, as shown in detail in Fig. 5.

The elevator device, for raising and lowering the secondaries to obtain the proper coupling, is shown in Fig. 6. Two square, nickeled-brass tubes are provided, of dimensions shown, and two pulleys are mounted at the top of each, mounting pins being soldered on the inside of the tube, as shown. The mounting of the tubes must be as rigid as possible, and this is best accomplished by slitting the ends and turning out flaps, as indicated. The cap at the top of each tube is made from a hard-rubber switch knob, which is screwed to a small disk of hard rubber, and is held in place in the top of the tube by a strip of spring brass, bent to form an expanding "U," as shown.

A lead counterweight is provided, of proper size to counterbalance each completed secondary. The author found it convenient to cut pieces of lead sufficient to counterbalance the coil, then after building a wooden mold, to pour the lead to form a weight of proper shape. This weight will vary according to the



The Large Photograph Shows the Appearance of the Back of the Cabinet When Fully Opened So As to Expose the "B" Batteries, the Condensers and Rheostats, and the Primaries of Both the Arc and Spark Couplers. The Insert Shows How the "B" Batteries can be Removed and Laid on Top of the Cabinet for Inspection, or When It Becomes Necessary to Provide New Batteries

materials used. All the weights are covered with chamois, so as to make the coupling operation noiseless; and the square hole in the base of the secondary coil, through which the tube passes, is lined with leather to eliminate all friction noise.

The circuits are all shown in the diagram, Fig. 2; little need be said as to the connections for the short-wave side, as they are the ordinary "straight audion hook-up."

To change from arc to spark, and vice versa, it is only necessary to reverse both of the double-pole switches or jacks. The switch at the left controls the phones, and the one at the right the aerial and ground connections. Current is supplied to either filament by closing the two-point switch in series with it.

It will also be noted in the diagram that the permanent connection of the aerial is to a single-blade, double-throw knife switch. The connection is made to the blade of the switch; the latter is thrown upward when messages are to be received, and downward at other times, so that the aerial is grounded for protection against lightning.

The cost of a set such as described will of course depend on how many of the necessary parts are made and how many are purchased. With a reasonable effort to save money, it should not be over 75 dollars at the very most.

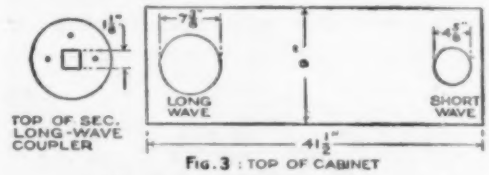


Fig. 3 : TOP OF CABINET

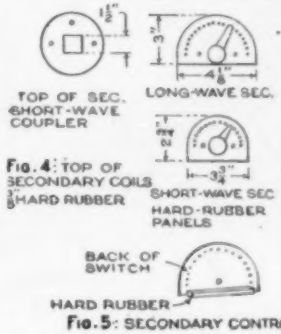


Fig. 4: TOP OF SECONDARY COILS
Fig. 5: SECONDARY CONTROLS

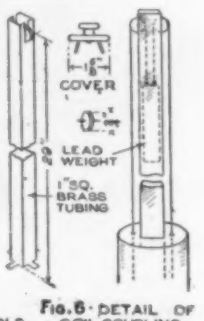


Fig. 6: DETAIL OF COIL COUPLING

Details of Construction: In Figures 3-6 Are Shown the Shape and Dimensions of the Secondary Mountings, and Their Controls

MATERIALS NECESSARY

2 back-mounted rheostats (battery).
2 23-plate back-mounted variable condensers.
1 5-plate back-mounted variable condenser.
1 43-plate back-mounted variable condenser.
2 3-way telephone jacks, or D.P.-D.T. switches.
2 double binding posts for phones.
10 small binding posts.
18 switch knobs complete.
154 switch points.
2 pieces ¼-in. hard rubber, 8⅝ by 14 in.
1 piece ¼-in. hard rubber, 14 by 23⅝ in.
2 pieces ½-in. birch, or mahogany, 9 by 14½ in.
2 pieces ½-in. birch, or mahogany, 9 by 41½ in.
2 1-in. square brass tubes, 29 in. long.
4 ¾-in. pulleys.
1 8-in. square piece hard rubber, ¼ in. thick.
1 5½-in. square piece hard rubber, ¼ in. thick.
1 3 by 4½-in. piece hard rubber, ¼ in. thick.
1 3 by 4-in piece hard rubber, ¼ in. thick.
16 1-in. machine screws (nickeled).
19 1-in. wood screws.
2 ¾ by 14-in. thin brass strips (nickeled).
20 3-cell flashlight batteries.
2 bulb sockets.
1 seamless cardboard tube, 7½ by 13 in.
1 seamless cardboard tube, 6¾ by 12 in.
1 seamless cardboard tube, 5 by 13 in.
1 seamless cardboard tube, 4¼ by 8½ in.
No. 22 double cotton-covered wire.
No. 28 double silk-covered wire.
No. 30 double cotton-covered wire
No. 32 double silk-covered wire.

Protecting Auto Engine from Cold

Unless measures are taken to protect an automobile engine during the winter, a great deal of trouble may be experienced as a result of excessive cooling. Spark-plug porcelains often crack when subjected to a cold blast of air while heated by the explosions in the cylinders; the carburetor fails to function properly, and the spark plugs are likely to become fouled with oil if the motor is not kept warm. Tin or sheet-iron shields will go far toward eliminating these difficulties. One of these should be installed on the intake manifold, and shaped so that it protects not only that part of the manifold supplying the forward cylinder, but the carburetor as well. Another shield should be attached to the top of the forward cylinder, and extended upward and backward to deflect cold air from the spark plugs. In making these shields, a pattern of cardboard should be fitted before the material is cut. Further protection may be obtained by bolting sheets of tin or iron to the inside of the hood in such positions as to close the ventilating slits along the sides. If the entire hood is lined with sheet asbestos, the engine will run efficiently in the coldest weather likely to be encountered.

Cyclometer Measures Mountain Trails

Information regarding the length of certain mountain trails was required for

By Pushing a Bicycle Wheel with a Cyclometer before Him, a Pedestrian Measures the Exact Length of a Mountain Trail

a guidebook. The paths were difficult to measure by the use of a pedometer, because of the rough ground and the winding of the paths.

A measuring instrument was made by mounting a bicycle wheel and cyclometer in a discarded front fork. This was fitted with a long shank and a handle. When pushed along the trail, the turning of the wheel is registered by the cyclometer, thus recording the exact distance covered by the pedestrian.

A Simple Wire Snap

A quick-action snap is appreciated by those who work around horses, or who often have ropes to fasten quickly. The sketch shows a snap made from heavy spring-steel wire. It is easily formed, and fastens over a ring or staple with only one motion of the hand. The size can be made to meet requirements, and the work be easily and efficiently done on the farm, or in the home.

Low Wagon for Silo Filling

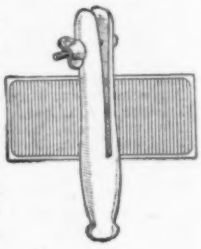
For filling silos, or other work about the farm, a low wagon is often convenient. To convert the ordinary high wagon into one of this type the reach is removed, and two 2 by 6-in. oak planks, about 16 ft. long, are fastened edgewise to the underside of the rear axle, about 4 ft. apart. They should be held in place with U-bolts or wire. The forward ends are next brought together, and a 2 by 6-in. plank, about 10 in. long, nailed between them. This shorter plank should have a hole drilled through it so that it can be secured to the underside of the front axle by the kingbolt.

This V-shaped frame, which will easily carry a one-ton load, takes the place of the reach. On it, and far enough back so that the front wheels will not interfere while turning, a platform, about 7 ft. wide, is constructed of planks.

A wagon of this type is so low that, when in use, the fodder may be loaded or unloaded directly from the ground, and without an extra man on top being necessary.—John T. Bartlett, Boulder, Colorado.

Clothespin Used as Vise

When it is necessary to do delicate work on small articles of jewelry, a clothespin makes a very dependable vise. Pass a small screw through the lips of the pin, secure it with a wing nut, and fasten the head of the pin with screws, or nails, to a table or window sill. The wing nut makes it possible to make very delicate adjustments, so that the lips of the pin hold the article steady, while the softness of the wood prevents it from being crushed.—Abel Green, New York, N. Y.

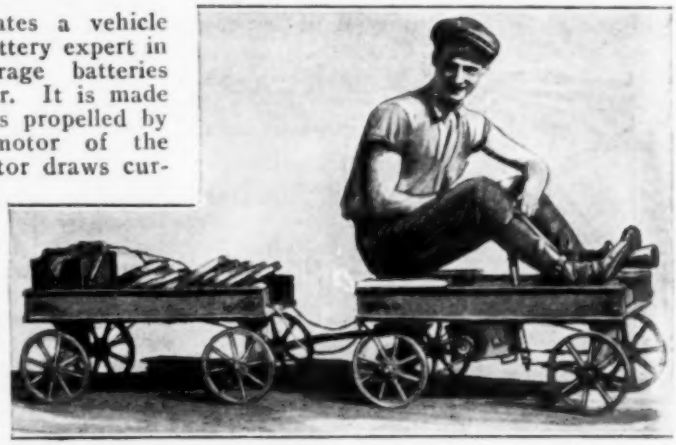


Oil Limits Evaporation of Alcohol

Alcohol, which is considered by some to be the only thoroughly satisfactory antifreezing agent for automobile radiators, has the one fault of evaporating rapidly. This tendency may be largely overcome by pouring 1 or 2 oz. of very thin lubricating oil into the radiator. The amount depends upon the size of the car.—Paul A. Johnson, Rockford, Ill.

Coaster Wagons Driven by Auto-Starting Motor

The photograph illustrates a vehicle used by a Pennsylvania battery expert in carrying automobile storage batteries from one place to another. It is made of two toy wagons, and is propelled by an automobile-starting motor of the single-unit type. The motor draws current from a six-volt, 80-amp.-hr. storage battery, which is carried in the rear end of the trailer. The motor carries a 19-tooth sprocket, and a 37-tooth sprocket is mounted on the rear axle of the front wagon, so that the speed is reduced in ratio of 1.95 to 1. A silent chain, 30 in. long, transmits the power, and the current is carried from the battery through 8 ft. of No. 4 copper wire. A two-point switch, having plenty of current capacity, is used, one point being connected directly to the motor, and the other point to a resistance, used for starting. With the six-volt battery a speed of from 8 to 15 miles is attained with the usual load. A 12-volt battery has been found to give from 17 to 22 m. p. h. Great care must be exercised, however, in applying the higher voltage to a motor built for six volts only. It is also very important that the wagon used be one which is strongly constructed, as a cheap toy wagon can readily be broken down by the weight of one or more storage batteries and the wear and tear due to the operation of the motor. The outfit illustrated is in daily use in the delivering of storage batteries, after recharging and repairing, and it is found quite satisfactory for its purpose.



Two Solidly Built Toy Wagons, an Automobile-Starting Motor, and a Common Automobile Storage Battery, Are the Component Parts of an Outfit for Delivering Storage Batteries and Other Heavy Objects

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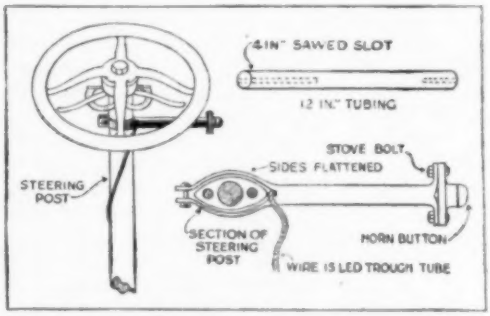
Mounting for Auto-Horn Button

The bracket illustrated, for mounting the horn button of an automobile in a convenient place directly under the steering wheel, is readily made from a piece of steel or brass tubing. This is perhaps the most convenient place for the horn button, unless it is placed on the steering wheel itself, which causes continual twisting of the wires, and is, therefore, not to be preferred. The tubing may be ½ in. in diameter, and is slotted for a suitable distance from each end. The end to go around the steering column will probably be slotted about 4 in., and the other end, to fold out for attaching the button, about 1 in. The two wires leading to the button may be twisted around the steering post or, better, led through a piece of conduit down to the dash.

A button so mounted is always within reach of the driver's finger except when turning very sharp curves, and even then it is quite easy to find in emergencies. The tube may be bent slightly upward to bring the button nearer to the rim of the steering wheel, if this is found to result in added convenience.



The Horn Button may be Mounted in a Very Convenient Position under the Rim of the Steering Wheel by the Use of a Piece of Tubing

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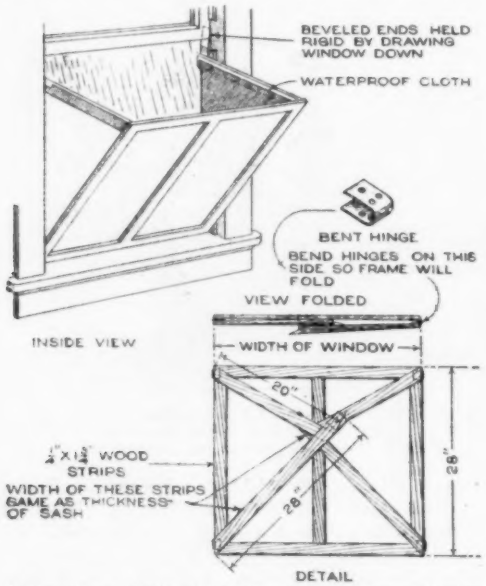
¶ Corks which have been used a long time, and do not fit the neck of the bottle, can be renewed by putting them in boiling water and leaving it to cool.

A Collapsible Window Ventilator

A very great aid to health in cold weather is an efficient type of window



A Ventilator Made of Wooden Frames Covered with Oilcloth is Readily Detached and Folded Up

ventilator. To leave windows open in cold weather without some device to distribute the air properly merely causes the incoming cold air to settle at the floor of the room, while the warm air rises to the ceiling, where its heat is largely wasted. The incoming air should, therefore, be deflected upward so that it will be warmed by mixing with the warm air in the room. Another objection to leaving windows open in winter without a ventilator is that rain and snow are quite sure to blow in.

The device illustrated is no more efficient as a ventilator than some other types, but it has the advantage of being readily taken off and folded up, so that it can be put away in fine weather. The ventilator consists of three members, hinged so as to fold together. The rectangular member is as long as the width of the window, and may be 28 in. high, or less if preferred. It and the two triangular pieces are both light frames of wood, covered with oilcloth or some other water-resisting material. At the vertical edges of the triangular pieces are two strips which project above them, and are beveled off at the top to a sharp edge. These strips fit into the groove in which the lower sash works, and the sash, when brought down, clamps them firmly in position, thus holding the ventilator securely in place. If the hinges on one side of the ventilator are bent somewhat as shown, the device can be folded up. —F. E. Leitch, Brooklyn, N. Y.

Spacing Nails on Boxes

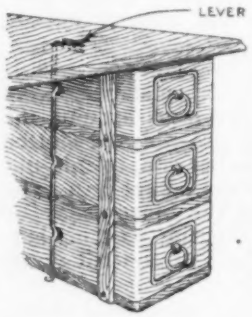
Observations of packages which have failed in service and tests on packing boxes by the U. S. Forest Products Laboratory have shown that the most common defect in box construction is inadequate nailing. Attempts to strengthen boxes by the use of thicker lumber, without regard for nailing, very often only wastes material. The extra wood may not be needed so much as a few more nails.

Nails holding boards to the end grain of the box end should be spaced 1¾ in. apart, and nails holding boards to the side grain of the end, 2 in. apart, when nails are 6-penny, or less. Increase the spacing ¼ in. for each penny over six. No board should have less than two nails at each nailing end. Space the nails holding the top and bottom to the sides 6 in. or more apart, when the nails are 6-penny or less, increasing the spacing 1 in. for each penny over six.

While such spacing may appear to be too close, it actually calls for only about two-thirds of the number required to balance the strength of the nailed joints with the strength of the box in other respects. With the spacing given above, the nailing is still the weakest point of the ordinary box.

Convenient Drawer Lock

To prevent young children from upsetting the drawers of sewing machines and desks, a bent rod can be mounted as illustrated. The rod, or stiff wire, is bent to a right angle at the top, and kinks are made in it which project into holes cut in the sides of the drawers. A shallow groove on the top of the desk allows the level end of the rod to sink into it, preventing it from turning except when lifted.



A Stain for Glass Windows

Window staining, for privacy or other purposes, can be quickly and cheaply done at home without calling in a professional workman. The only materials required are white shellac, dye of the desired color, and waterproof varnish.

For a white window, which admits light, but which is not transparent, coat the glass carefully with white shellac, dissolved in alcohol. After the shellac is dry, apply another coat, if necessary; then, after drying again, cover with the waterproof varnish. Such a window can be washed indefinitely without removing the stain.

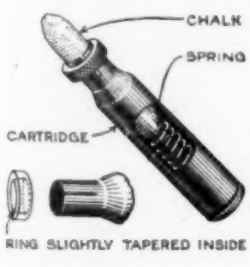
Colored windows are made by mixing ordinary cloth dyes into the shellac until the desired shade is attained. For instance, for photographic darkroom use, mix orange and crimson dyes into the shellac until it is very dark. Cover with varnish when dry, as with the white coat. This forms a durable coating which can be washed, and which is not difficult to remove with alcohol. It serves the purpose, and costs much less than stained glass.—J. Horace Van Nice, Chicago, Ill.

Double-Mesh Screens for Durability

Ordinary window screen must be replaced in from one to four seasons, depending upon conditions. Changing them spring and fall always damages them more or less. By covering the regular wire mesh with another piece of screening having a larger mesh, such as ¼ in., the screens will stand much more abuse, and often last as long as 15 seasons. This more than pays for the additional cost.

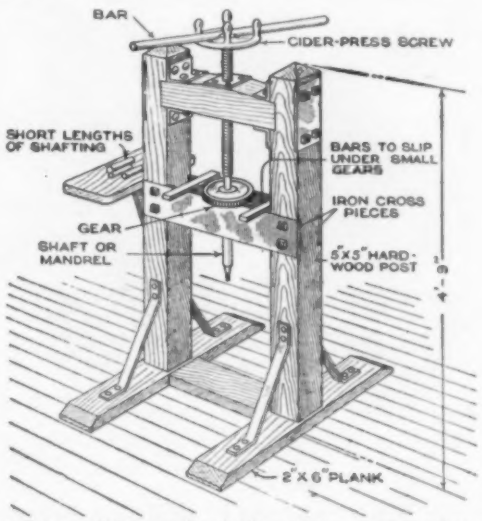
Chalk Holder Made from Cartridge

A large-caliber cartridge is readily made into a handy chalk holder in the manner illustrated. The small end of the cartridge shell is split in three places, and a knurled ring with a tapered hole is made to fit onto it, so that when it is pushed on, the chalk is held. A coil spring inside the shell pushes the chalk out when the ring is loosened.



Arbor, Bushing, and Gear Press

A useful and easily constructed bushing and gear press, for use around the small-town garage and on the farm, may be made in the manner here described. An old cider-press screw, complete with its handwheel and crossarm, is obtained at a junk yard. Next, two hardwood posts, about 5 in. square, are secured, and the crossarm is mortised into these and firmly bolted; this should be about 5 in. from the top of the posts. Now screw down the handwheel, as far as the threads will allow. Mortise two heavy iron bars into the posts, one on each side; the top edge of these should be about flush with the lower end of the screw. These bars are to hold the work to be pressed. Short bars may be placed at right angles to the long ones, to accommodate small work. Short lengths of shafting of different sizes should be kept handy, for pressing out shafts from gears. When pressing in new bushings, the new one should be placed on the old one; the new bushing thus pushes the old out as it takes its place.—Fred W. Page, Winfield, Kan.



A Substantial Press for the Small Shop, Not Unpleasing in Appearance, can be Built Around Parts of an Old Cider Press

¶For giving a white coating to work that is to be laid out for drilling, used carbide makes an excellent substitute for chalk. Before using, draw off the water so that it will be about the consistency of paint, then apply evenly with a fine brush. When dry, the surface is ready for marking.

A Mechanical Mystery with Tubes

Two tubes are first shown to be empty, by passing one through the other and

A Simple Device Is the Hook over the Tube, Yet One Which can be Made Very Mysterious

then exhibiting each in turn to the audience, who can see right through the tubes. Yet, at command, various articles are removed from the interior of the tubes, such as potatoes, handkerchiefs, dishes, fruit, or anything the performer desires to produce.

The trick is very simple, as the "load" is merely hidden in one of the tubes, while the other is exhibited. The articles to be produced, such as an assortment of fruit, are put in a handkerchief or tied together with string, and suspended inside one of the tubes by means of a hook that protrudes over the top as in the illustration. Both tubes are the same in height, but one is a little bit narrower than the other so that it can pass through it. The articles are suspended in the smaller tube which stands on the left side of the other. First the larger tube—the empty one—is picked up and shown to be empty, by holding it up so that anyone can see right through it. Then pick up the smaller tube, being careful not to let anyone see the inside of it, and lower this tube down through the larger one. As the extending hook reaches the tube, it will catch on so that the suspended load is lifted from one tube to the other. Now the smaller tube can be shown empty.

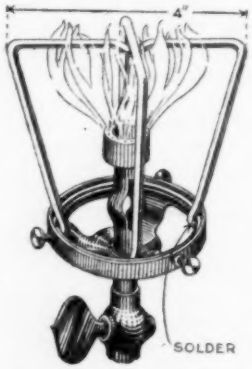
Then produce the articles; as each tube was in turn shown empty, the production of fruit will be mystifying. The small hook cannot be observed unless the audience is too near, and at the end of the trick, this hook should be removed under cover of some of the articles produced. Then the audience can examine the whole affair.—Clarence T. Hubbard, Hartford, Conn.

Auxiliary Cells beneath Floor Boards

When occasion arises to add four or five dry cells to the equipment of an automobile, for the purpose of auxiliary ignition, it is not always easy to find a convenient location for them. To stow them under a seat frequently means to encroach on space that already is very limited, and a satisfactory alternative is to place them under one of the floor boards. This can be done by removing the board and nailing a small box to the lower surface, to be used as a container for the cells. The wire leads can be brought out through one small hole in the board. When the cells are to be renewed, the board is removed from the car, and the container is opened by raising one of its sides, which is fastened to a hinge, and so forms a lid. This construction makes it unnecessary to cut a hole in the floor board to provide access to the container, so that the strength of the floor is in no way impaired.

Cooking Bracket on Gas Jet

Where it is desired to keep water or food on a gas jet, great assistance can be



furnished by a wire frame which fits into the shade holder, as illustrated. The frame should be made of stiff steel wire, and the lower ends of the two U-shaped pieces may be soldered to a ring of the same wire, which is formed to the same size as the base of the shade. It is then firmly gripped by the same setscrews which hold the shade.—F. W. Runge, Elmira, New York.

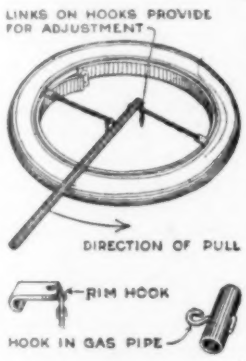
¶Long-necked vases can be cleaned by filling them with hot water in which small bits of paper have been mixed, then shaking vigorously. The wet paper removes the grime and sediment.

Tomato Foliage as Insect Killer

It has been proved that there are properties in tomato foliage which have a destructive effect upon blight of various kinds, especially plant lice. There is generally an abundance of this foliage in kitchen gardens, and good results can be obtained by doing no more than placing some of the leaves upon blight-infested plants; but it is, of course, more practical to make a solution for spraying. Bruise some of the foliage in a pan, pour on boiling water, and add more leaves until the solution is of a deep-green color. Let it become tepid—not cold—and spray the plants abundantly. The preparation may be used without restriction as to quantity, since it is harmless to vegetables, though very effective in destroying blight. It loses its power in a few days, but fresh supplies can be very easily prepared.—S. Leonard Bastin, Bournemouth, England.

Chains Pull Tire from Rims

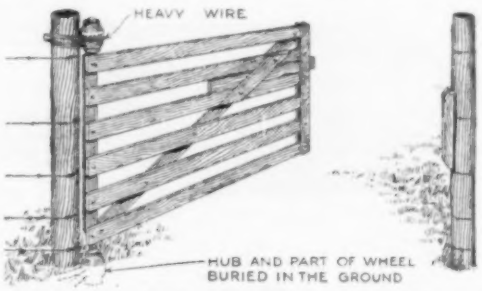
An easily constructed and easily carried tool for the removal of split rims from automobile tires is made from two 15-in. pieces of chain, and a short piece of gas pipe. After the latch holding the ends of the rim together is knocked loose, the two hooks on the ends of the chain are attached to opposite edges of the rim. A pull, in the direction indicated, on the end of the pipe quickly loosens the rim from the tire. Adjustments for the various sizes of rims can be made by providing hooks on the pipe, to which any length of the chain can be attached. The removal of a rim from the casing is not an easy job in any case, but a tool of this type makes it much easier than when it is attempted with ordinary tire tools.—G. A. Luers, Washington, D. C.



¶Copper ash trays may be made by pounding the edges of the copper plates upon which announcements and invitations have been engraved. Besides having interest as souvenirs, they are very durable.

Wagon Axle Used as Gate Hinge

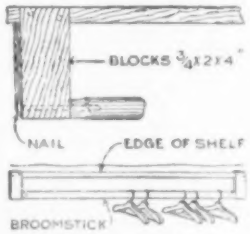
On almost every farm can be found an old wagon or implement wheel with its axle. The illustration shows how it can be made to form one side and a very effective hinge for the farm gate. The axle is set upright with the slats of the gate bolted to it. The lower end of the axle should be fitted with an old hub to serve as a bearing. The hub on the upper end should have at least one spoke remaining in it, so that the latter can be thrust through a hole bored in the gatepost. Some stout wire, or iron strips, will be necesary to hold the hub up against the post.—H. F. Grinstead, Columbia, Mo.



An Old Axle, with Parts of the Two Wheels Remaining upon It, Forms an Essential Part of This Easy-Working Farm Gate

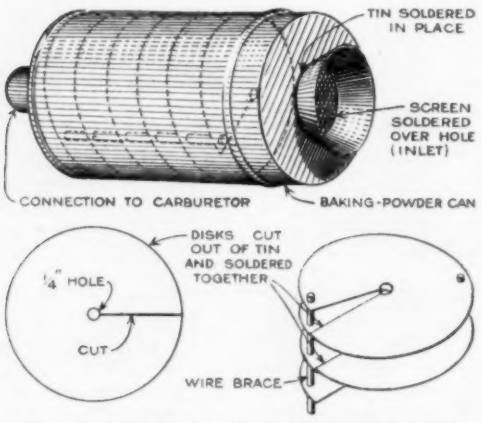
Rail for Coat Hangers

A very convenient method of hanging wearing apparel in a clothes closet is here described. Make two wood blocks of the dimensions shown, and drill a hole through one end of each, the size of an eight-penny wire nail. Push a nail through each hole and drive it into the square-cut end of a broom handle, or other similar round stick. Fasten the rack so formed to the outer edge of the closet shelf by driving two nails through each block, as shown; it is best to sink the blocks flush with the edge of the shelf. Clothes hangers can be hung and freely moved on this rod, and the method is more convenient and economical of space than the practice of hanging on wardrobe hooks, besides being a time-saver at moments when one is usually in haste.—W. H. Wilcox, Los Angeles, Calif.



Air Filter for Tractors

One of the things that tractor operators have to contend with is the dust



A Flannel-Lined Spiral, Along Which the Air Circulates, Acts as a Filter, Retaining Small Particles of Dust

which collects in the carburetor. Under ordinary conditions the tractor is running in fields which yield hot, dust-laden air. A screen over the intake port sifts out the larger particles, but does not stop the small ones, which eventually collect in the bowl of the carburetor or, getting by, remain in the cylinders to cut and wear down their smooth surfaces.

A simple air sifter which removes practically all the floating dust, while in no way retarding the efficiency of the motor or carburetor, is here described. The materials required consist of some old baking-powder cans, some stiff steel wire, a little wire screen, and ¼ yd. of cotton flannel or some old husking mittens.

Using a can about 3 in. in diameter and 6 in. long, cut a hole in the cover, 2 in. in diameter, and solder over it, on the inside, a piece of wire screen, as shown. Six disks are cut from scrap tin, each of the proper size, to fit rather snugly in the can. These are all provided with a ¼-in. hole in the center, and a cut is made from the rim to one side of the hole. Now bend each disk in the form of a spiral, and solder the consecutive ends together, so that when completed, the six disks will have the form of a complete spiral, making six turns, with a 1-in. space between each turn.

To hold this in shape two wires are run through holes drilled near the edge of the disks as shown, and are made secure by slightly bending or upsetting at the ends. The spiral should fit into the can so that each end nearly touches the ends of the can, being kept separated by the projecting ends of the wire.

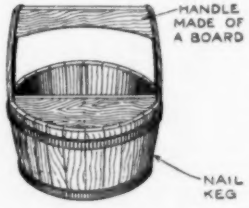
When this has been finished, cover the upper side of the spiral with glue. Make six disks of the cotton flannel, of the same size as the tin disks, and glue them to the spiral, making one continuous surface of cloth on the intake side of the spiral. This flannel is the agent for collecting the dust, and is cleaned once or twice a day, if the conditions are bad, with a small brush. A toothbrush will do the work nicely.

For the carburetor connection, a short length of pipe made of tin is soldered to the other end, or bottom, of the can, and slipped into a piece of hose, which is connected to the carburetor. Wire, or lengths of light strap iron, may be used to hold the filter in place.

It may seem that, with the central hole in the spiral, the air would simply go direct to the carburetor through this opening, but as a matter of fact, after being drawn through the first hole of the spiral, it spreads and is deflected against the sides of the spiral. Thereafter it travels about the spiral path, and is in contact with the flannel all the way until it reaches the carburetor.—Dale R. Van Horn, Lincoln, Neb.

Shop Tray Made from Nail Keg

A nail keg, cut down as indicated in the sketch, makes a handy tray for use in the shop. Two of the staves are left full length, and between their upper ends a board is fastened for use as a handle. The carrier is handy either for carrying tools or materials about the shop, or for keeping parts from getting lost when a machine is being taken apart.



Eliminating Matches from the Shop

In cases where smoldering matches are apt to set fire to oily waste, or other inflammable material, a light may be had, for pipe or cigar, by holding the wick of a candle close to the gap of an ordinary knife switch, carrying a light cur-

rent, while opening it slowly. After using, the candle may then be put away on top of the switch box for the next comer.—Philip A. Wall, Bedford, Mass.

Several Methods of Discouraging Automobile Thieves

Theft of an automobile can be prevented by removing indispensable parts of the ignition mechanism. Those most easily carried away are, of course, the ones to select, such as the ignition fuse, which can be slipped into the owner's pocket, while a blown fuse takes its place to confuse the thief. Another part easily carried is the rotor on the distributor head, which is keyed onto its shaft, and consequently can be slid back into position without disturbing the timing. Spark coils are more cumbersome, but these can be removed from the coil box and locked in the baggage compartment, if the car is equipped with one. There is little difficulty in interchanging the wires leading to the spark plugs, but where this is done, the owner must be careful to readjust the leads before cranking. A secret switch can be installed between the battery and the ignition switch, the best kind for the purpose being the small snap variety used on lighting circuits, which may be hidden under the ledge of the front seat or beneath the instrument board on the dash. If there is a gang switch with individual pull buttons for lighting and other circuits, the wiring can be changed in such a way that the names stamped on the plate indicate wrong circuits.

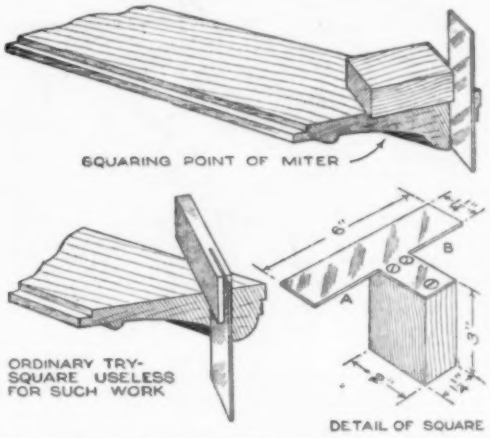
On the degree to which the car is dismantled depends the probability of a quick repair job by the thief, and any part which he is unlikely to duplicate is the best one to remove. Not many automobile thieves carry a large stock of interchangeable accessories.

Brush Cleans Metal for Soldering

A brush which will clean a metal surface for soldering may be made from a piece of tin, and a small bunch of rather light stiff wires cut to a length of 1½ in. The tin is rolled over the wires and pounded down tight, to make a brush that will not loosen with service. This brush will scratch almost any ordinary dirt from metal, leaving the clean, bright surface, which is always necessary if a good job of soldering is to be done.—Chet W. Shafer, Three Rivers, Md.

Square for Use on Mitered Joints

When a molding of the shape indicated in the drawing must be accurately mitered, the ordinary try-square is of but little use in testing for a right angle.



For Squaring the Faces of Mitered Molding, a Peculiar Try-Square Fulfills Requirements for Which the Ordinary Square Is Not Fitted

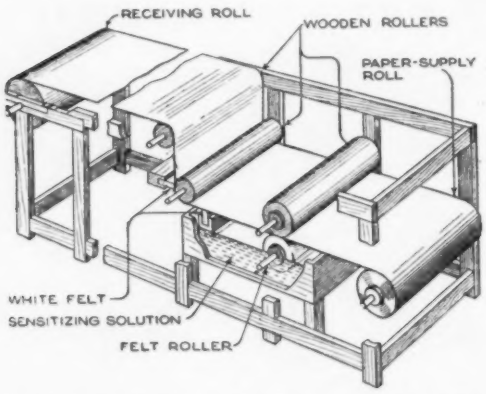
The miter box cannot be relied on to produce work accurate enough for all cases, and it becomes advisable to have a special type of square which will take care of this condition. Such a square is shown at the right of the drawing. It is made by attaching a T-shaped piece of stiff sheet steel to a block of hard wood. The block must be very carefully calipered, so that the 1¼-in. dimension will be correct all over the block, and the two 2 by 3-in. faces must be accurately planed. The principal requirement for cutting out the steel piece is that the two edges A and B must lie in a straight line which is perpendicular to the 2 by 3-in. faces of the block.—Henry Simon, Laguna Beach, Calif.

Pencil as Mounting Roller

Mounting photographic prints when the mounting roller has been mislaid may be found a difficult task. A good substitute for the roller can be found in a large pencil, of the kind used as marking pencils, and a flat wooden ruler. Place the print in position on the mount, lay the pencil across it at one end, and lay the ruler over the pencil, at right angles. Then roll the pencil up and down the print by moving the ruler back and forth, applying pressure above.—Elmer O. Tetzlaff, Chicago, Ill.

Blueprint-Paper Sensitizing Device

The writer had occasion to use a large number of quite small sheets of blue-



A Small Apparatus Like This Enables One to Prepare Blueprint Paper in Narrow Rolls, as Required for Special Purposes

print paper, and constructed the apparatus illustrated, so as to sensitize his own paper at a fraction of the cost of the commercial product.

The paper used was the kind sold in rolls, for use in adding machines. This paper is about 2 in. wide, and can be bought for a few cents a roll.

As shown in the drawing, a felt roller makes contact with the sensitizing solution, and carries it to the paper. This roller is made by compressing a large number of white-felt washers between metal disks at the ends of a threaded rod. The roll is then set between centers in a lathe or grinder, and finished off smooth with sandpaper, or an abrasive wheel. Above the felt roller is a plain wooden roller, which is adjustable, so as to hold the paper firmly against the felt roller. The smaller rollers are also made of wood; near the lower one, two strips of heavy white felt are mounted, so as to brush the surplus solution from the paper. Of these, the one farther to the left is made adjustable, so that it will leave just the right amount of solution on the paper. The paper-supply roll, at the right end of the drawing, runs free on its axle; the receiving roll, at the left, may be driven by a hand crank, or by a small motor through a worm drive.

Between the rest of the machine and the receiving roll, the writer installed a 5-ft. tin box, open at the ends, through which the paper was drawn, while a current of warm air was blown through it by a small motor blower. This insured thorough drying before the paper was wound up.

The fluid used for sensitizing consists of two solutions, made separately and mixed together only for immediate use. The first is a solution of 10 drams of potassium ferricyanide in 4 oz. of distilled water; the second is 15 drams of ammonium citrate, similarly dissolved in 4 oz. of distilled water. The addition of ½ grain of potassium bichromate to each ounce of the mixed solution will improve the keeping qualities of the paper.

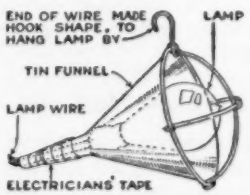
The complete process should be conducted in a dark room, or one with very little light, and the apparatus should be thoroughly washed after use. Metal parts which come in contact with the solution should be coated with shellac or asphaltum varnish, to prevent chemical action which might ruin the solution.—Henry B. Graves, Jr., Rochester, N. Y.

Chair Seats of Paper

Nearly every household possesses a few chairs of the cheaper type, with seats made of light veneer, or with papier-mâché, or fiber substituted for leather. Such material is a little fragile, but is easily replaced when broken. For instance, the heavy cardboard of which many shipping boxes are made is quite strong enough for the purpose. Cut a seat of the same size and shape as the broken one, and fasten it in position with round-headed tacks.—Jack Solon, Vicksburg, Miss.

Reflector and Protector for Lamp

An automobile owner, who had occasion to use an electric light on an extension cord, for repair work at night on his car, constructed the illustrated device in a few minutes. A bright tin funnel was placed over the wire, after this had been disconnected from the socket. The funnel opening was secured to the light wire with tape, and several pieces of wire extended over the outer end of the bulb for protection at this place. One end of this wire was bent up to form a hook, by means of which the light was hung. Such a light concentrates the rays on the work being carried on under the car.

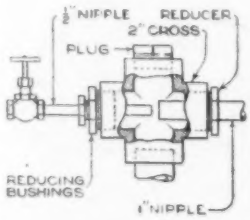


Extension Handles on Petcocks

To overcome the inconvenience of opening automobile valves and petcocks, short extension handles made of ½-in. gas pipe are valuable. For the shut-off valve on the gasoline tank, the radiator drain, and the oil-level petcock, such handles are fastened to the valves by slotting the ends of the pipe, drilling holes in the valve handles and the pipes, and then securing the pipes to the valve handles by the use of small cotter pins. The extension pipe handles are carried to convenient places in the dash and floor, and, in the case of the radiator drain, through the side of the engine pan. These extensions permit opening or closing the valves without reaching under the car.

A Simple Steam-Jet Pump

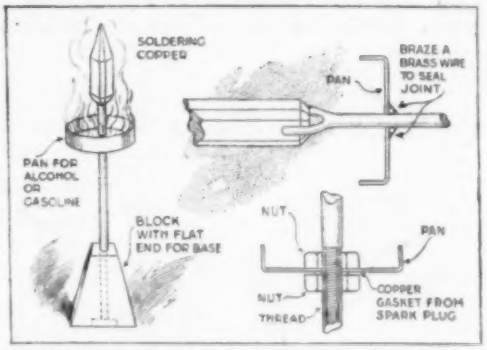
A steam pumping jet, while not very efficient compared with a reciprocating pump, is nevertheless useful in many places where a pump is not available. The illustration shows how to make one, at a very small cost, which should handle about 120 gal. per minute. In the ends of the 2-in. cross tee, place reducing fittings so as to take ½-in. and 1-in. pipes, respectively. Cut a long thread on a ½-in. nipple, and screw it into the ½-in. reducer, until it almost reaches the center of the cross tee. Screw a 1-in. nipple into the opposite side until the ends of the nipples are not over ½ in. apart. Connect a 2-in. suction pipe to the bottom of the tee, and place a plug in the top.



Such a steam jet will give good satisfaction on various temporary pumping jobs, and will handle mud and sand, which would soon wear out the valves of the reciprocating pump.

Heating the Soldering Copper without a Torch

The soldering copper is a useful addition to the tool equipment of the automobilist, but without means of heating the iron it may as well be left out. Leaking tanks, pipes, radiators, and many other defects may be quickly repaired by means of solder and a hot iron, and there are various ways of heating the tool, whether the work is done in a garage or on the road. A vulcanizer, if one is carried, will serve in an emergency, it being merely necessary to pour in an ounce or so of gasoline, ignite it, and prop up the iron in such a position that the flame will envelop the copper. If, however, no vulcanizer is carried, the cup or lid of a can may be used for the gasoline or alcohol.



A Soldering Copper with Its Own Heater Attached will be Found a Useful Article in the Tourist's Tool Box

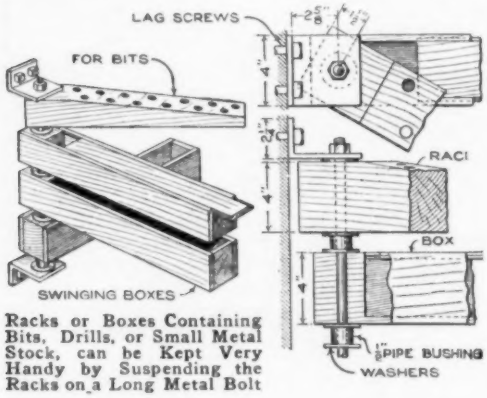
But a still better scheme is to carry a soldering iron with a fuel holder permanently attached. The problem in attaching such a holder is to make it leak and heat-proof, up to the temperature which will be produced in it by the burning gasoline. This temperature is too high to allow of soldering; the holder should therefore either be brazed on, as shown at the upper right in the sketch, or attached with nuts, as shown below. The latter method has the disadvantage of requiring a long thread to be cut, thus weakening the stem, but it may be an admissible method where no brazing torch is available. A large wooden base, with a flat bottom, will enable the soldering copper to stand upright while being heated.

Heater for Hydraulic Test Basin

On a job where a trough of cold water was required for testing purposes, trouble was experienced during cold weather from the freezing of the water. The trouble was remedied by installing an ordinary soft-coal stove near by, with a coil of pipe built into it, and two pipes leading from the ends of the coil to the upper and lower parts of the trough, respectively. The water thus circulated through the stove and the trough.

Swinging Tool Racks or Shelves

Where shop space is at a premium, a great deal can be saved by hanging

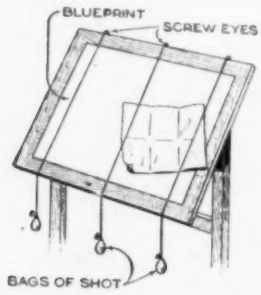


Racks or Boxes Containing Bits, Drills, or Small Metal Stock, can be Kept Very Handy by Suspending the Racks on a Long Metal Bolt

things on the wall in compact racks. The drawing shows how a large number of bits, screws, or other small parts, can be kept in boxes, or racks, hung on a long vertical bolt, attached to the wall or to a post. A few iron angle pieces will be required—also some washers and ½-in. lengths of pipe to separate the various boxes or racks. Boxes used for this purpose must have a block in one end, through which the bolt passes.

Cords Keep Drawings in Place

Unless drawings are firmly secured to the drafting board, they are in danger of tearing loose, or being blown away by a current of air from an open window, during the draftsman's absence. The sketch shows a method of holding the drawings or board cover in place. Three or more strong hemp cords are fastened at equal intervals at the top of the board. They should be of sufficient length to pass across the board, and hang over the edge several inches. A little cloth bag, filled with lead shot, or other heavy material, is tied to the end of each cord. These weights serve to draw the cords taut; they are thrown aside when the board is in use.—Kenneth Coggeshall, Webster Groves, Mo.

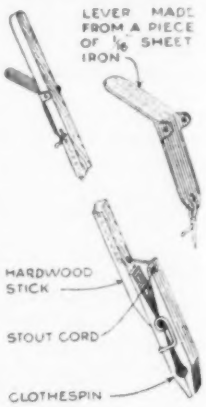


Tin Chloride Removes Rust

A rusty metal rule may be made silvery white in color by allowing it to remain overnight in a saturated solution of tin chloride in water. Rinse the tin solution off the rule by holding it in running water. Dry with a chamois, and keep it in this improved condition by the use of oil. The solution may be kept for future use.—W. S. Standiford, Youngstown, Ohio.

Reaching Device Made of Clothespin

The handy pick-up device shown in the illustration is one that can be easily and quickly made, and such a tool is valuable to the motorist for reaching into the depths of his splash pan, and about the parts of the engine, for a lost screw, nut, or cotter pin. It is also handy for storekeepers, for reaching for small articles in the show window, and is useful in many other lines.



A spring clothespin is secured to a stick of hard wood, by means of two screws through one leg, and is operated by means of a stout cord, or piece of piano wire, passed down one side of the stick, and worked through a hole, the cord being connected to the outer leg of the clothespin. A handle for pulling the cord is made from a piece of sheet 1/16-in. iron, as shown in the detail.

Slotted Nail as Polishing Reamer

A very handy polishing reamer for use on small work can be made by sawing a slot in a nail a little smaller than the hole to be polished, setting a small piece of fine emery cloth in the slot and bending it around the nail. Such a reamer is useful in places such as the bearing of the rocker arm in a magneto timer; with it the bearing can be easily polished.—J. Magis-Frankart, Ouffet, Belgium.

¶ Food-chopper clamps will not work loose if a piece of coarse sandpaper is placed, rough side up, under the upper side of the clamp.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

Protected Feeding Boxes for Birds

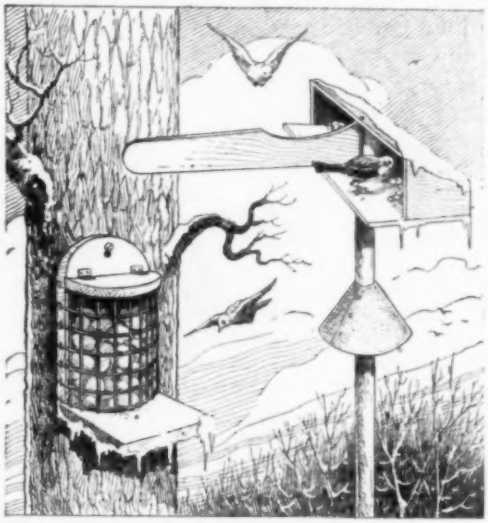
By E. W. RANSTON

A VERY large number of game birds are killed every year by cold and starvation, especially in late winter and early spring. In summer and fall, the birds do their duty so thoroughly in devouring insects and farm pests, that there is nothing left for them to feed on when winter comes, and the idea that they are all saved by migration is now definitely proven a fallacy.

Hunters and farmers will be well repaid for putting out a few "bird lunches" for hard-pressed birds, when snow and winter storms prevent them from foraging. Almost any box will serve the purpose. It should be mounted on a post several feet above the ground, so that the feeding bird will have some chance of escape from preying animals, and so that cats and dogs will not find the food too easily. The box shown in the photograph is perhaps a little too near the ground, but it has done duty for two seasons, and many birds have been observed enjoying its contents. It is 2½ ft. long, 1 ft. deep, and 16 in. high.

The Simplest "Bird Lunch" Consists of a Box Mounted on a Post. But Even It may Bring Cheer to Many "Feathered Friends"

Birds will find these lunches more easily, if they have grown accustomed to the locations before winter blizzards arrive, but the provisions will not be wasted, even if the feeding station is not used till the middle of winter, as some hungry bird is sure to find it some time during the season.



More Elaborate Provision for the Birds' Comfort may Include Wire to Keep the Food from Falling Out, or a Vane to Keep the Wind from the Shelter

About once a week the lunch box should be replenished. Corn and grain will make the best winter diet, but grit of some kind should always be placed with the food. Occasionally, a bird, with its crop full, has been found dead in winter, simply because it could not find the necessary grit with which to grind its food. Table scraps of almost any kind may be used, but they should be chosen from among the varieties that are least likely to harden by freezing.

If the box is placed on the leeward side of a large evergreen tree, it will have some protection from storms, and the birds will have a better chance to eat in safety. Where the foliage is really heavy, corn may be placed on the ground until snow comes, but, after that, the box

must be used. The height of the pole, on which the box is placed, depends, to some extent, upon the customary depth of snow in a locality, but it should always project at least 3 ft. above the snow level.

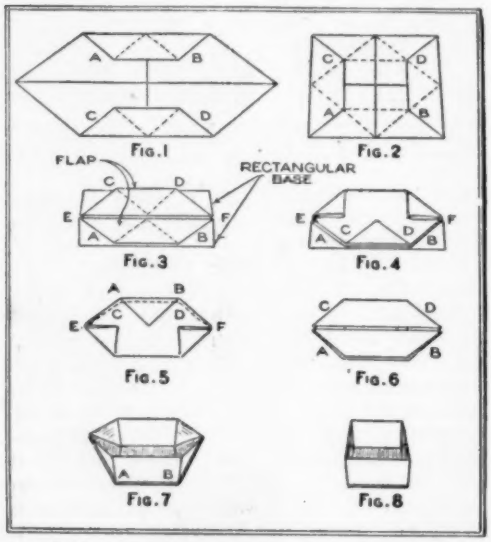
As an alternative, a container may be placed on a tree trunk, as shown to the left in the drawing. It can be made of two slabs of wood nailed together at right angles, one of them forming the floor and the other the rear wall. A network of wires gives it the form of a cage, and keeps the food safe from cats and other animals. A container of this kind, replenished occasionally with suet, has done good service in preserving the lives of birds which could not obtain insect food.

The shelter shown to the right is another interesting design. It is pivoted so that it will turn easily, and is provided with a vane that will always keep the closed side toward the wind. In order to make it balance perfectly, a large nail should be driven in the closed side near the middle, where some weight, such as an old horseshoe, may be hung. The pivot is a long bolt or rod, driven into the top of the post, and passing through holes in both bottom and top of the shelter. A guard of tin should be nailed around the post supporting the shelter, to prevent inroads of mice or by cats.

How to Make a Square Paper Cap

To make a paper cap of the kind still worn in some shops, cut a sheet of paper about 16 in. square, fold it along both diagonals, and spread it open again. The point where the two creases intersect is the center of the square.

Fold one corner so that the point falls on the center of the square, and open it out again. A short crease will now be visible, crossing one of the diagonals. Fold the same corner again, but this time bring the point to the center of the short crease just made. Keep the point down in this position, and fold the paper again along the short crease, so that the point is hidden under the flap. Then do the same thing to the opposite corner, so that the paper will appear as in Fig. 1. The shortest of the creases are marked AB and CD respectively.



In Eight Successive Steps a Paper Cap is Made Tight Enough to Stay on the Head, and Loose Enough for Comfort

Turn the sheet over, and do the same thing to the other two corners, so that the paper will appear as in Fig. 2. It will be noticed that the act of inverting the sheet has caused AB and CD to exchange positions.

Keep the paper the same side up, and fold it along the lines CD and AB, so that it will appear as in Fig. 3. Two flaps will now meet at the center, along EF, with a rectangular base below them.

Turn one of the flaps over on the other, as shown in Fig. 4, so that CD and AB coincide, and turn down the two distant corners, so that their points rest on the line EF.

Then turn the flap back again over the folded corners, restoring CD to its former position, and repeat the process with the opposite side, making AB coincide with CD, as shown in Fig. 5, and turning over the two nearest corners so that their points will lie on EF.

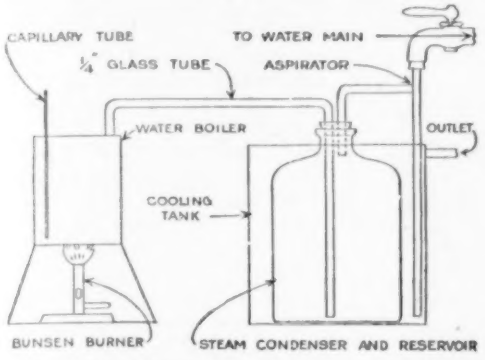
Fold back the flap over the turned-down corners, so that AB returns to its former position, and we obtain the kite-shaped object shown in Fig. 6, with a slit running down the center. Insert the fingers into the slit and pull outward, but be careful not to loosen any of the folds in doing so. The result will be the hollow-shaped object appearing in Fig. 7. Crease the corners, and a square cap is formed, as seen in Fig. 8.—F. H. Sweet, Waynesboro, Va.

Iron will not rust if coated with a paste made from linseed oil and whiting.

Water Distilled in Partial Vacuum

In laboratories where only limited funds are available, the problem of obtaining distilled water readily in gallon quantities is very difficult.

The accompanying diagram shows an arrangement which makes it possible to boil water at low pressures—hence correspondingly low temperatures. If good pressure is at hand in the water-supply main pipes, an aspirator can be operated to maintain a vacuum of about one-fifth of an atmosphere, in which about 190° F. temperature is required to produce steam. This steam or vapor is readily condensed, since not much of a temperature change is required, and collected in the condenser and reservoir shown in the diagram. The water used to operate the aspirator is used to cool the condenser vessel.



An Aspirator, Operated by the Same Water Which Cools the Reservoir, Makes Possible the More Rapid Production of Distilled Water

If a capillary tube is placed in the boiler so that its lower end is below the water, and as near to the bottom as possible, air will bubble up through the water. This will increase the rate at which water distills more than 25 per cent, and the distilled water is also aerated to some extent. This arrangement can be set up very readily and operated, with very little attention, by one of ordinary experience.—J. Garrett Kemp, Stillwater, Okla.

Ring Held on Tie by Cork

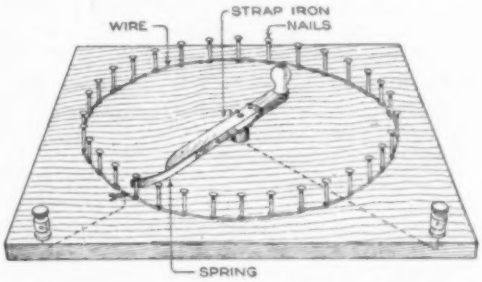
A finger ring can be worn on a four-in-hand necktie without danger of its slipping off, if a small cork is inserted between the ring and the tie back of the latter. The cork should fit snugly, and should be pushed into place with its smaller end toward the knot.—Forrest Benson, Boulder, Colo.

Cue Tips Valuable as Bumpers

Discarded leather cue tips, which may be obtained for the asking at any pool room, serve to prevent damage to walls if glued to the backs of picture frames before the pictures are hung. When applied in the same manner to the bottom of a small phonograph, the tips are excellent substitutes for rubber rests that have become unserviceable.

A Rapid Circuit Interrupter

In electrical experiments, as, for instance, in working with induction coils, it is often interesting to have an instrument for making and breaking a circuit rapidly. Such an instrument, in order to be most useful, should give a ready means of calculating the number of makes and breaks per second. The illustration shows how a breaker can be made from some scraps of wood and wire and ordinary wire nails. The nails should be located equidistantly around a circle of any convenient size, and a stick pivoted at the exact center with a very light contact spring attached. A metal sheath, tacked to this revolving stick, makes an electrical connection from the spring to the center screw, through which the current is carried to a wire underneath the board,



An Instrument Made from Wire Nails and Scraps of Wood and Copper Wire Forms a Circuit Interrupter for Experimental Use

and thence to the binding post. To the other binding post is attached a piece of solid-copper wire, which runs underneath the board to a hole through which it comes up; it is then wound with one turn around each one of the nails, returning finally to the start and completing a circuit of wire which connects all the nails together. The revolving stick is provided with a crank or handle, and can be turned any desired number of turns per second. Multiplying this number by the number of nails gives the number of interruptions per second.

Homemade Dry-Battery Cells

By R. R. HENDERSON

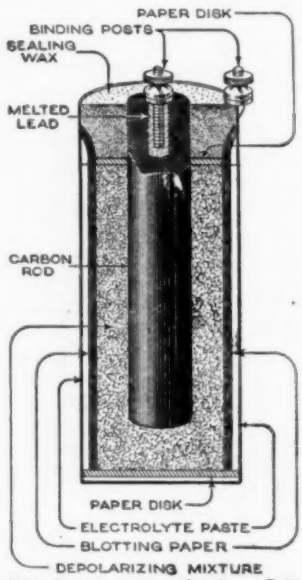
AN ordinary dry battery is fairly easy to make, without much difficulty or expense, if the proper procedure is followed. The most common size is known as the No. 6, which is about 2½ in. in diameter and 6 in. high; a sectional view of it is shown in the sketch. It consists of a zinc container with a carbon pole, which runs down the center through a depolarizing mixture, and the sides of the container are coated with an electrolyte paste. The depolarizing mixture must be kept carefully separated from the zinc wall, by means of a sheath of blotting paper. If contact takes place, the result is an internal short circuit, and the battery rapidly loses strength.

The container serves as one pole of the battery, and is made of No. 10 gauge rolled sheet zinc. The top is open, and the disk which forms the bottom must be soldered tightly to the sides, so as to prevent any chance of a leak. A small binding post is soldered to the upper edge.

The central pole is a hard-carbon rod, about 5 in. long and 1 in. in diameter. The carbon rod from a worn-out battery may be used, or an ordinary arc-light carbon. The latter, however, is likely to be coated with copper, and this must be carefully removed with a file or sandpaper, as the presence of iron or copper in the interior of the battery interferes with its action. A small quantity of melted lead must be poured into a hole drilled in the top of the carbon, and before it hardens, the end of a brass binding post must be inserted, so that it will be firmly imbedded when the lead cools.

The paper sheath, or lining, consists of several layers of blotting paper. Cut a number of disks, about 2½ in. in diameter, and also make a tube, several layers thick. The outside diameter of the tube should be about 2¼ in., so that it will fit loosely in the container, and the tube should be long enough to come within ½ in. of the top.

The electrolyte paste consists of 4 oz. of ammonium chloride, 1½ oz. of zinc chloride, ½ pt. of water, and a quantity of flour. Dissolve the ammonium chloride and the zinc chloride in the water, and add flour to make a thin paste.



The Construction of a Dry Cell Presents Little Difficulty, Most of the Materials being Easily Obtained in Drug Stores

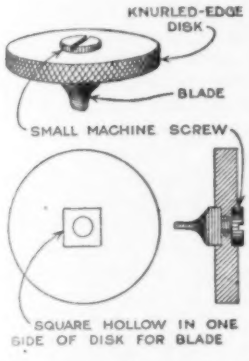
The purpose of the depolarizing mixture is to absorb the gases given off at the carbon pole of the battery. If these were not absorbed, they would cling to the pole and increase the resistance to the passage of the electric current, thus cutting down the capacity of the battery. The ingredients are as follows: 13 oz. of manganese dioxide, 10 oz. of carbon or ground coke, 2½ oz. of graphite, 2½ oz. of ammonium chloride, 1 oz. of zinc chloride, and 3½ oz. of water. Of these six ingredients, the first four are mixed together till they form a fine powder, while the zinc chloride is dissolved in the water. The solution is then stirred into the powder to make a very stiff paste. All six components are easy to obtain. The manganese dioxide can be purchased from any wholesale drug firm, and the carbon may consist of ground electric-light carbons (first freed from any trace of copper) or ground soft-coal coke. These two should be in the form of a fairly fine powder. The graphite may be purchased in powder form at most hardware stores, and the ammonium chloride and zinc chloride at a drug store.

To assemble the battery, first coat the bottom of the container with the electrolyte paste. Then soak the 2½ in. blotting-paper disks in some of the paste. Place the disks, well soaked, at the bottom of the can. Coat the outside of the blotting-paper tube with the paste, and also the inside of the zinc casing; insert the tube in the casing. There will thus be a layer of electrolyte, about ⅛ in. thick, all around between the blotting paper and the zinc. Then tamp in about 1 in. of the depolarizing mixture at the bottom of the tube. Place the carbon rod in the center, and tamp in the rest of the depolarizing mixture around it, until the container is filled to within 1 in. of the top. Tamp the material hard, but be careful not to break the blotting-paper lining, as this would render contact possible

between the zinc and the depolarizing mixture. Then cut a disk of blotting paper about 2 in. in diameter, with a hole in the center just large enough to allow the carbon rod to pass through, and place it on top of the mixture. The battery is then sealed by pouring hot wax above the upper disk. This wax may be composed of melted rosin, with a little tallow added. A mixture of asphaltum and coal tar may be used if these materials are available.

Screwdriver for Tight Places

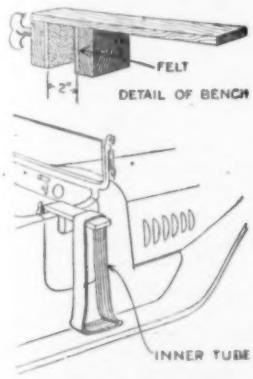
An ordinary screwdriver may often be useless, owing to lack of space in which to use it. In such circumstances, some plan must be adopted to make a screwdriver to suit the close quarters.



In one such experience, a disk was first made, and the edge was knurled, so as to permit a good grip on it. Short blades of various sizes, tapped out for a small screw to hold them, completed the affair. When assembled, it took up very little room, and accomplished the needed work very quickly and satisfactorily.—J. H. Moore, Toronto, Can.

Tire-Repair Shelf for Auto

For patching inner tubes when out on the road, a convenient device is to have a little wooden shelf, or workbench, which can be clamped by a wing nut to the door of the car. The shelf also forms a very convenient place to mount a small vise, if it is necessary to do a little filing or drilling, or if a vise is required for holding any small part to be worked on. The shelf can be removed very quickly, and takes up but little room in the tool box.—P. P. Avery, Garfield, N. J.



Small Photographs Mounted in Celluloid

With a little practice in the necessary manipulation of thin celluloid, it is not difficult to make over an old campaign or union button into a new button with any small picture or photograph desired. First, scrape off the old celluloid and design, and remove the pin and binding ring from the button. Cut the photograph or other small picture in a circle, slightly larger than the button. To cover it and hold it in position, use celluloid prepared as follows: Clean off the gelatin coating from an old piece of thin photo film, by soaking it in hot water. Cut out a round piece, a little larger than the button, and place it in enough alcohol to cover it. Denatured alcohol can be used, if caution is observed not to bring it in contact with a cut in the skin, or into the mouth, as this kind of alcohol is poisonous. After soaking for a few minutes, the celluloid becomes pliable. Work a large dent in the center of it with the thumb, to fit the curved surface of the metal button. The celluloid hardens quickly when removed from the alcohol, so that it may be necessary to soak it three or four times.

By the Use of Some Old Photographic Film, Any Small Photograph can be Mounted on a Button, with a Transparent Cover

Now fit the photograph to the button by placing them together, wrapping a handkerchief, or rag, around them, and twisting the latter as illustrated, so as to turn the edges of the photo around the edges of the button. Remove the cloth, transfer the celluloid quickly from the alcohol onto the button, and again twist in the cloth. Put in the binding ring, and run a sharp-pointed knife around inside the ring to cut off the surplus celluloid. If the binder ring, in being replaced, is obstructed by the celluloid, the latter may be softened in alcohol. While the celluloid is being twisted on, cloth and all may be dipped in alcohol to soften it.

Replace the pin and let the button dry. In appearance it can then hardly be distinguished from a manufactured button.

A LIGHT MOTOR-DRIVEN SNOW SPEEDSTER

By L. B. Robbins

ONE of the great joys of winter is coasting and sledding, but the first is denied boys who have no coasting hill, and the second is not nearly so much fun unless there is some sort of a hill. But by building two sleds into the very simple motor-driven bob illustrated in Figs. 1 and 2, the thrills of speeding over the snow can be enjoyed in any locality, whether hilly or not.

The only material required which is at all expensive consists of two sleds, a motor wheel, some canvas, and a few automobile parts, which may be obtained from junk dealers or wrecking houses.

The Running Gear

The two sleds should be of equal size, and should be equipped with round iron runners. One of them is kept whole for the forward truck, while the other is split in half, lengthwise, and the halves are bolted through 4 by 4-in. blocks to the long plank that forms the base of the body, as shown in Fig. 3. The halves of the rear-sled deck are then sawed off flush with the inner sides of the 4 by 4-in. blocks.

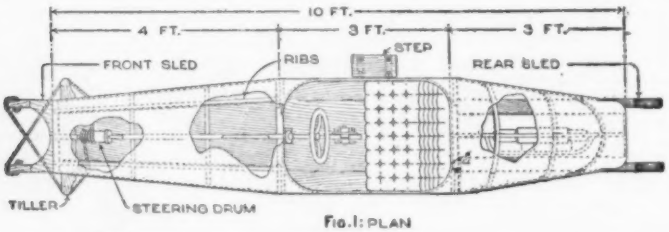


FIG. 1: PLAN

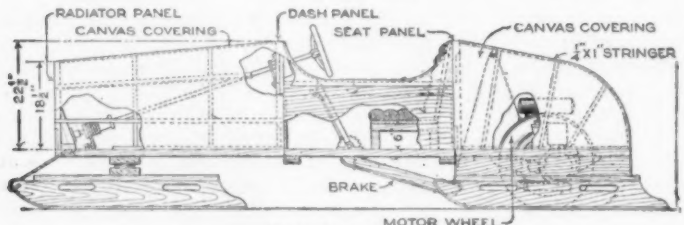


FIG. 2: ELEVATION

Here Is the General Construction of the Speedster, Including the Steering Gear and the Control Arrangement by Which One Lever, in Addition to the Spark and Throttle, Starts and Stops the Machine

The base plank, detailed in Fig. 4, forms the connecting link between the two sleds. Preferably, it should be clear, straight-grained, hard pine. One end is rounded off, and a section is sawed out of the rear end to take the motor wheel, leaving two projections from the main plank, not unlike the tines of a fork. Some distance back of the front end of the plank, on its center line, bore a hole for the turning bolt. Bolt two extensions to the sides of the plank, along its central part, which will bring the total width at this portion to 23 in. In its center, cut a slot for the lever which operates the brake and clutch, as described below.

In Fig. 5 is shown the construction around the turning bolt. One of two oak blocks is bolted to the deck of the sled just forward of its center, and the other to the underside of the plank. Two large iron washers are placed between the blocks, to insure clearance between the bolts in the plank and those in the front sled. The nut on the center turning bolt should be set up only loosely, and should then be held in place by a cotter pin, a castellated nut being used, if possible, for this purpose. The large hole through the center of the lower block and sled deck should be made a very loose fit for the turning bolt, so that the front sled can follow irregularities in the road without any difficulty.

The Body

Three wooden panels are used to form the body; the construction of these is illustrated in Fig. 6. Round off the top of

each to give shape to the "bonnet." The front, or "radiator," panel is fixed at the forward end of the plank, and braced by a right-angle block at the base. The two larger panels are placed at the ends of the widened portion. The sides of this section are boxed in by nailing on two pieces of wood, of the shape given in Fig. 7. The curved side effect can be obtained by bringing canvas up over these sidepieces to the top of the panels, cutting out the circular shape with a knife, and bracing the canvas with stiff wire.

The forward and rear sections are also covered with canvas, stiffened between the panels by light stringers, ribs, and hoops of thin, springy wood or wire. A stout central stringer is run along the top of the front section, and another, bent by steaming, is run along the top of the rear section, coming down to a short rib stretched across the plank projections. The other end of it runs to the top of the seat panel. To these stringers are attached the hoops and ribs. Four lower stringers will be required for attaching the lower edges of the canvas cover. Two of these are mounted in front and two in the rear, and serve to give a smooth shape to the body. In the rear section, it is advisable to have a segment of the canvas cover easily removable, so as to get at the motor wheel when necessary. This segment may be fastened to the lower stringers by automobile-curtain fasteners.

When the framework of the body is fully set up, paint it thoroughly before covering; then stretch 8-oz. duck over the front and rear sections, using copper or galvanized tacks. Begin along the top stringer and gradually pull the canvas down around each form and away from the center.

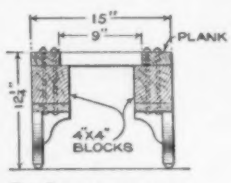


Fig. 3: REAR RUNNERS

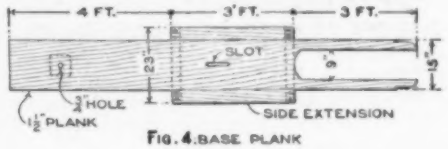


Fig. 4. BASE PLANK

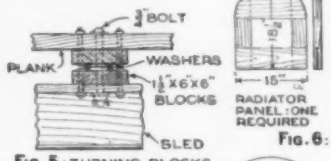


Fig. 5: TURNING BLOCKS

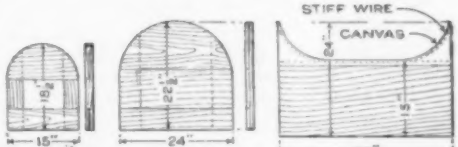


Fig. 6: PANELS

Fig. 7. SIDES TWO REQUIRED

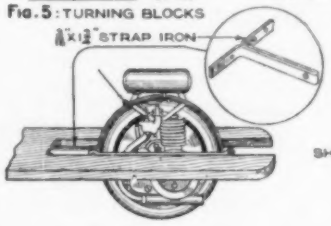


Fig. 8: POWER PLANT

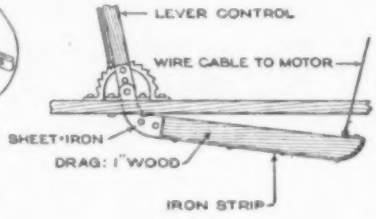


Fig. 9: BRAKE

Various Details of Construction: Only a Few Manufactured Parts Other Than the Motor Wheel are Required

Steering Gear and Controls

Before covering the framework, however, it will be necessary to install the steering column and controls, as this cannot very well be done with the frame inclosed. Just under the triangular block supporting the radiator panel, is a stout oak crosspiece for the steering tiller. This is shown in Fig. 1. Fasten a swivel pulley to each end of the tiller, and lead a stout rope from each end of the sled through these pulleys to the ones on the plank opposite the drum on the steering column. The steering ropes should cross each other, as shown, otherwise the tiller will have to be so long that it is likely to get damaged.

The steering column, shown in Fig. 2, may be taken from a discarded automobile. The forward end rests in a pipe flange bolted to the face of the triangular block supporting the radiator panel. A wooden drum, provided with flanges at both ends, is pinned to the column, and on this the steering rope is wound. The upper end of the steering column rests in a hole bored at the proper angle through the dash panel. A second triangular block and flange, on the rear side of the dash panel, add to the strength and appearance of the steering column, and a cotter pin, bearing against a strap-iron retainer on the front of the panel, keeps the column from being pulled upward.

A seat is built against the seat panel; it may be made from an old automobile

seat or can be built readily from two wide boards, covered with canvas, and stuffed. The back should be inclined slightly for the comfort of the user.

The Power Plant

The motor wheel should be attached in such a manner that it can be removed easily and quickly and put to other uses. A piece of strap iron, bent double, and having the ends again bent back so as to form a "T," will provide a hanger similar to the arrangement found on a bicycle, and will answer the purpose quite well. Such an arrangement is illustrated in Fig. 8. Drill two bolt holes in each arm of the "T," and a hole in the shank to receive the pivot pin of the motor wheel. Then bolt the "T" to the head of the opening in the plank, and attach the motor wheel as shown. This arrangement allows the motor all the play necessary, and it can be removed easily by raising the rear sled from the ground high enough to enable one to reach under and take out the pivot pin. Bring the spark and throttle controls of the motor wheel through the seat panel to the steering column, and place them in a convenient position.

The driving wheel is raised from the ground by the movement of the lever which operates the brake. This is shown in Fig. 9. The lever itself is a brake lever complete with a ratchet, taken from an old automobile. To its lower end is attached a wooden board, shaped as shown, and covered on the bottom edge with a strip of iron, which should be fairly heavy. Bolts should be run up through this drag piece, the heads being below and the nuts on top, so that the bolt heads and the iron strap will form an effective braking surface when forced down against the snow by pulling back on the lever. No dimensions are given for this drag, as it will be easy to lay out the shape freehand on a stout board, after the framework of the sled is built.

To the rear end of the drag is attached a small wire cable, which runs over a pulley, and is attached to the motor wheel. This cable should be made of such length that, when the control lever is pulled back, the first effect will be to lift the motor wheel from the ground, which is equivalent to releasing the clutch of an automobile. As the lever is pulled farther back, the drag brake is forced down against the snow. Care must be taken, in proportioning the drag and attaching the cable, to see that the cable clears the seat panel. When the control lever is in its extreme forward position, the motor wheel must bear with its full weight on the ground.

Finishing

When the motor and controls are installed and the body frame covered, give the canvas two or three coats of paint of suitable color. This can be striped and decorated as desired. Lights will also be necessary for night driving.

When the paint is dry, the speedster is ready to be taken out on the snow. It can be started by pushing it along, running at the side until considerable headway is obtained, and then lowering the motor wheel to the ground. This will start the engine, and the rider hops aboard. Another way is to raise the motor wheel from the ground, start it by hand, then step aboard, and when the motor has attained good speed, gradually lower it to the ground.

The speed which can be expected from such a vehicle is not high enough to cause any great concern to parents. It depends chiefly on the smoothness of the snow. The speedster is not intended for heavy going through soft snow, and when such is encountered, it may be necessary for the occupants to get out and push. But on smooth, hard-packed snow, especially with the wind in a favorable direction, the young motorist should be able to work up enough speed to give him plenty of excitement.

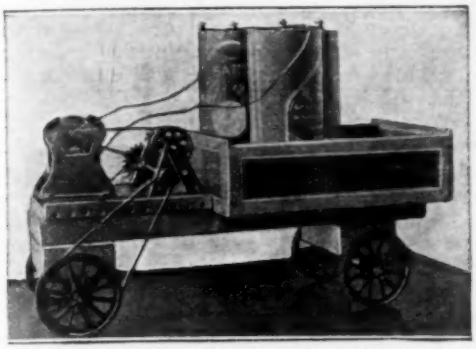
An Airplane Weather Vane

Not content with building a scale model airplane, one boy enthusiast hung his model by a cord from a wire stretched between two trees. The suspending cord was attached so that the plane hung exactly level, when there was no wind. When the wind blew, it could be observed doing banks, turns, and occasionally looping the loop. As the wires were too small to be visible from the road, the presence of an airplane in the sky attracted a good deal of attention from passing motorists.

Hung from a Wire Which Is Not Visible from the Ground, a Model Airplane Forms a Weather Vane Which Attracts Much Attention

A Toy Electric Motor Truck

The size of this little car, made largely from toy building-set parts, may be judged by the cigar box which forms the body part of the truck. There is a centerboard running under the body, which supports the motor in front. This is



Lifelike Motor Truck, Which will Run All around the Room, is Made from Building-Set Parts, a Toy Motor, and Some Dry Cells

screwed to it, as is the cigar box. The four wheels, which are about 3 in. in diameter, are grooved, and attached to small blocks of wood. The front block is stationary, while the rear one swings around so that the truck may travel about in a circle.

The driving bands are of ⅛-in. rubber, which does not slip as string would, and has no knots. The power from the motor is transmitted from the small pulley to a larger grooved wheel supported from the same base. At the other end of this same axle, a cogged wheel engages a larger cogged wheel on an axle just below, upon either end of which are small brass pulleys. Rubber bands run from each of these small pulleys to the large drivewheels, sinking into their grooves out of sight from the side. The power thus attained is such that the truck runs along very well on either carpet or bare floor.—Harry B. Bradford, Washington, D. C.

Metronome for Timing Prints

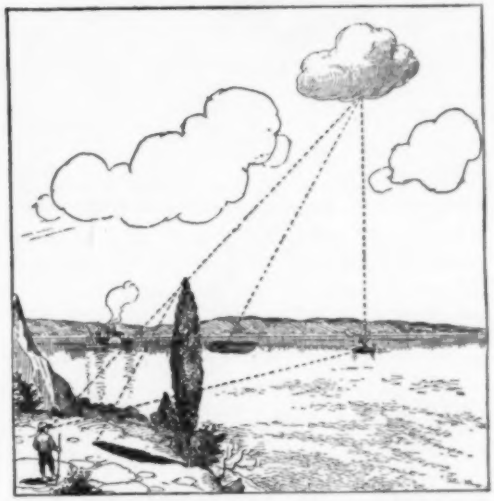
When a clock or other suitable timing device is unavailable, a metronome may be used in a photographic dark room as a timekeeper for printing and developing processes. It also is valuable for regulating the length of exposures when pictures are taken. The machine can be set to indicate seconds by its ticks, or to run at practically any speed desired.—Al. Schaal, Red Cloud, Neb.

To Observe the Height of a Cloud

On a day when the air is clear except for a few small, white clouds moving through the sky, it is sometimes possible to see almost directly the height of these clouds above the ground.

If, for example, a boy is standing on a hill, in a position such as is illustrated, and can see a cloud and its shadow, the latter thrown on some broad stretch of level ground, or, better still, on the surface of a lake or river, then the circumstances are very favorable for calculating the height of the cloud.

The observer should first station himself so that some tree or post is in the same vertical plane with himself and the cloud; that is, so that he can sight the latter directly over the top of the tree. He should then estimate the horizontal distance from the cloud shadow to the line along which he sights the cloud and



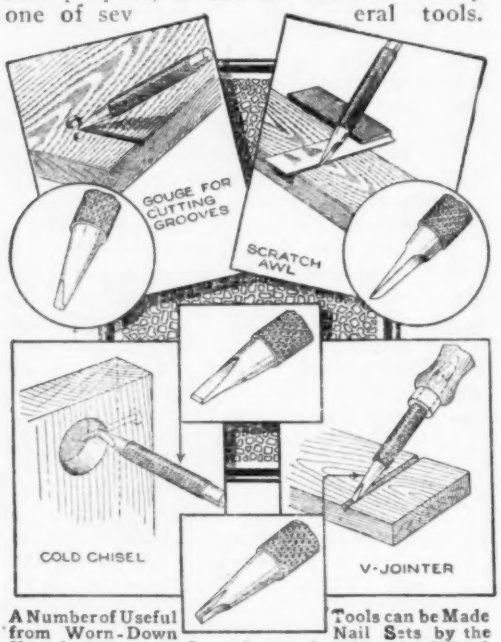
Sighting a Cloud Directly above a Near-By Post or Tree, a Boy can Form a Fairly Accurate Estimate of the Height of the Cloud above the Water

tree, this distance to be taken parallel with the shadow of the tree. The horizontal distance of the cloud from its shadow may thus, for example, be estimated to be half the width of the river, or twice the distance between a certain tree and the opposite bank.

The relation between the height of the first tree and its shadow is then estimated, and this ratio, times the horizontal distance of the cloud from its shadow, will give the height of the cloud. No great accuracy is possible by this method, but it is interesting nevertheless.

Nail Sets Make Handy Tools

After a nail set has been worn until it is too dull for further use for its original purpose, it can be made into any one of several tools.



A Number of Useful Tools can be Made from Worn-Down Nail Sets by the Use of a File, or, in Some Cases, of an Abrasive Wheel

To make the gouge, a groove may be made with a file, the tool being annealed before this operation, and hardened and tempered after it. The jointer, awl, and the cold chisel are made in similar fashion, except that the last two are more readily adapted to forming on the stone, thus avoiding the annealing process. On any of these tools, an ordinary file handle can be readily mounted, if found convenient. Several tools can also be made interchangeable in the same handle. If the hole in the handle becomes worn so large that the tool can no longer be held firmly by friction, one of them can be cemented in with glue, and a new handle made for the others.

Electroplating Nonconducting Surfaces

In many cases the copper coating deposited on an aeroplane propeller tends to blister or peel after a time, due to warping or shrinking of the wood when exposed to the weather. This is a serious defect which may be overcome by following the method outlined.

The article to be plated is first chemically cleaned, and then, after being suspended by two wires attached at distant points, is given a coat of shellac or collodion lacquer. If shellac is used, a 40-per-cent solution of silver nitrate in equal parts of water and alcohol is prepared. When the object is thoroughly dry, it should be dipped in this solution; then set aside to dry again and a second coating applied. If collodion lacquer is used, the silver nitrate should be dissolved in ether and alcohol. The solution, in either case, may be applied with a fine brush instead of by dipping.

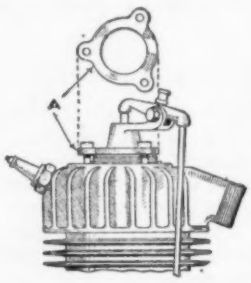
When this stage is completed, the silver is next reduced by exposing the article to the fumes of sulphureted-hydrogen gas, first making sure that the suspending wires make a good contact with the coating. This may be done by placing a drop of silver-nitrate solution at each of the two points and applying a few grains of powdered iron sulphate.

Another method of reducing is by the use of iron sulphate in a finely divided state. If this course is decided upon, the article should be suspended over a saucer containing a few lumps of iron sulphide. To this is added a little sulphuric acid, and the whole is covered by inverting a box over it. After a few minutes' exposure to the fumes, the article is ready for copperplating.

In case a silver or nickel coating is desired, the article should be taken from the copper bath and rinsed. Then, without allowing it to become dry or touching it with the hands, it should be transferred immediately to this new bath. When sufficiently coated it should be gone over with a scratch brush, then polished and lacquered in the usual manner.—A. P. Jones, Bremerton, Wash.

A Motorcycle Valve-Cage Repair

When the threads holding a motorcycle valve cage were broken out, a collar was fitted over the cage by tapping three holes into the cylinder head, and fastening the collar with cap screws smeared with red lead. This collar held the cage in place, making what seemed to be a permanent and entirely satisfactory repair.—Malvin C. Metzer, Silver Creek, Neb.



To Prevent Curling of Photo Mounts

Mounted photographs have a tendency to curl, with the print on the concave side; and when many mounted prints are kept together, the curves make it difficult to arrange them in neat piles, as each size has its own particular curve. The difficulty can be overcome by pasting a sheet of strong paper on the back of each mount, making the sheets a trifle smaller than the mounts. When the paste has dried, the mount will lie very nearly flat.—Fred C. Davis, St. Joseph, Mo.

Electric Lamp Made from Vase

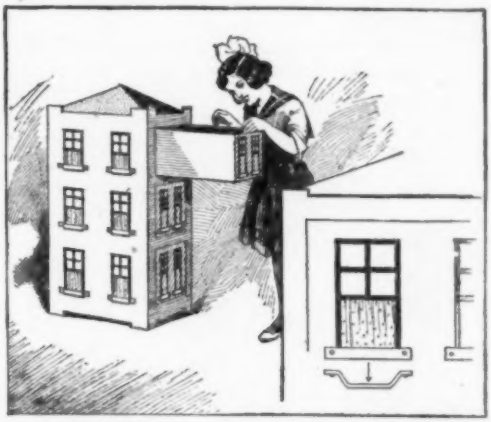
A very pretty lamp was made from an ordinary colored vase, by running a light into it from the bottom. The hole through the bottom was made in the following manner: The vase was turned upside down, and the bottom covered with putty. A hole was made in this down to the surface of the glass, large enough for the lamp cord to pass through easily. A small amount of lead was then melted and poured into the hole in the putty. Before the heat had time to spread into other parts of the glass, the lead was removed, and the vase quickly immersed in water, breaking out a round, smooth hole.

From a hardwood block a suitable base was made, and the wire was run through a hole in this, matching with the hole in the bottom of the vase which was then attached to the block with glue. The cord was brought up to the top of the vase, where the socket was connected to it. Electrician's tape was wound on the closed end of the socket. It was then pulled down to its permanent position.

If the bottom of the vase is too thick, a hole for the wire may be made through the side. The effect can be heightened by providing a shade made from parchment or colored paper. Or the wire may be placed out of sight, and the vase's unusual use will be apparent only at night. A subdued light is produced by the lamp, which is especially suitable for a bedroom.

Doll-House Chest of Drawers

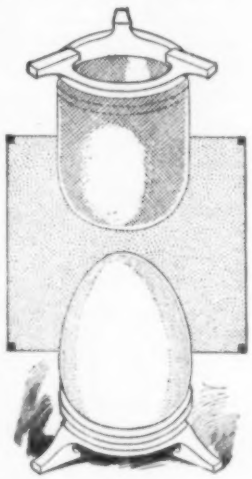
A chest of drawers for a child's room is made doubly interesting, if painted to resemble a doll house. Painted white with black windows, such a chest will look very realistic. Window balconies of the doll house serve as drawer handles. For play, each drawer becomes a room or floor in the house. The drawers are especially useful in that they furnish a place to store the toys and games.



A Chest of Drawers, to Accommodate a Child's Toys and Games, can be Made to Represent a Realistic Doll House

Egg Holder Made of Gas Mantle

A unique and ornamental egg holder, which is well adapted for table use, can be made from the frame of an inverted gas mantle, after the mantle itself is worn out. The legs that hold the mantle to the burner form quite excellent feet, on which the queer egg holder rests. —Florent D. Feltz, Hackensack, N. J.

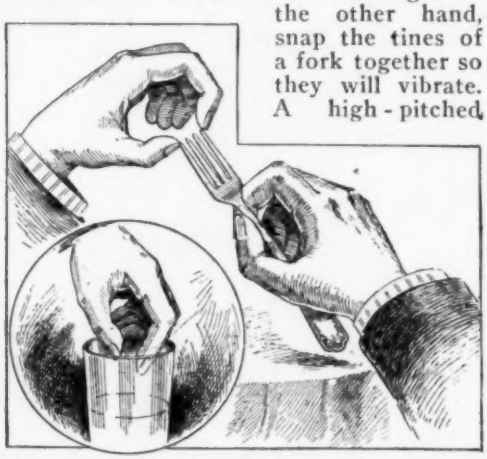


If the windshield of an automobile is rubbed with a piece of chewing tobacco, the vision through the glass will not be obscured by moisture in rainy weather, according to one motorist.

A Good After-Dinner Trick

Here is a good after-dinner trick that requires no apparatus or special setting to perform. It can be done sitting at the dining table.

Hold a fork in one hand, and with the nails of the thumb and first finger of the other hand, snap the tines of a fork together so they will vibrate. A high-pitched



The "Electricity of the Body" is Declared by the Performer to Increase the Sound of the Fork, But the True Explanation Is Much More Plausible

buzzing sound will result. Then, still holding the fork, as at the start, reach over with the other hand, and place the thumb and first finger in a glass as shown. The buzzing will change entirely to a slow, low pitch, which is very perceptibly different. It will appear that the fingers must vibrate, and that placing them in the glass causes the difference in the sound.

The most amusement will be afforded if it is not passed off as a "trick" at all. Just pick up a fork, snap it and ask the people at the table why placing the fingers in the glass makes this difference in the tone. They will say that they do not know—may be one or two will try to give some reason for it. In any event they will pick up a fork and try it themselves, and be very much surprised to find that the result is not produced when they do it. Then the performer can tell them it is the electricity in his body, and show them that if they let him hold the fork while they snap it, and place their fingers in the glass, the same result will be produced as when he did it entirely alone.

The trick is very simple, in fact so much so that they can stand all around the performer and never see it. The trick is this: When holding the fork, hold it in the hand so that the end of the handle will be just off the table; then when the fingers of the other hand are placed in the glass, a very slight movement of the first hand will bring the end of the handle into contact with the table. It is this touching the table with the fork that causes the change in tone.

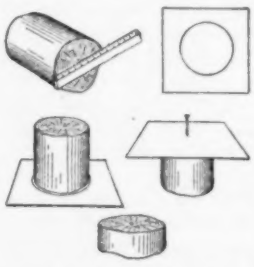
A person can have lots of fun with this trick, as it can be done anywhere. After the people get really curious, put the fingers in a china cup instead of the glass, and the tone will be still lower. This is done by pressing very hard on the table with the fork.—S. B. Royal, Philadelphia, Pa.

Garden Table Rests on Tile Pipe

A tile pipe, buried several inches in the ground to give it stability, makes a good standard for a garden table. A round block is cut to fit, not too tightly, the bell end of the pipe, but reaching a few inches below the bell portion. It is nailed to the center of a square or round table top, and forms a handy garden table.—James E. Noble, Toronto, Canada.

Centering Irregular Round Work

Even with common forms of center gauges and centering heads, difficulty may sometimes be experienced in finding the approximate center of a piece of stock for turning, especially if it is considerably out of round. The illustration shows a simple method of accomplishing this. The largest diameter of the piece to be centered is measured with a rule, and a circle which should be drawn to just the same, or slightly larger, diameter is made on a piece of paper, the compass needle being thrust well through the paper. The block is then placed exactly over the circle, and its position is adjusted so that the irregular space between its edge and the circumference of the circle will be as nearly of the same width at all points as possible. Keeping the piece of paper in this position, a pin or prick punch is placed in the center hole of the circle and a mark made through the paper on the wood. This gives an approximate center.



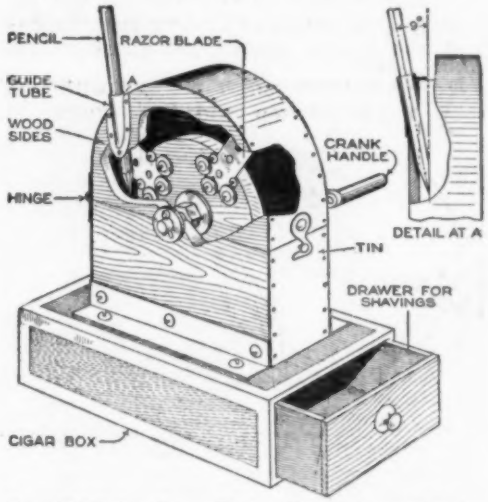
Rotary Pencil Sharpener Uses Safety-Razor Blades

Discarded safety-razor blades are sometimes used to sharpen pencils, but with varying results, since it is hard to hold and use them properly. The drawing shows a rotary sharpener which makes effective use of the blades. The blades can be changed quickly when dull, and the sharpener is not very difficult to make.

Four blades are mounted on a wooden disk, 4 in. in diameter and ½ in. thick, by means of screws and washers. These hold the blades firmly, yet allow them to be readily exchanged for others. The blades should be set with half of their length beyond the edge of the wooden disk. A 4 by ⅜-in. bolt is used for the shaft, the wooden disk being held firmly between two nuts on the bolt. The crank is made from a piece of wood, and is made solid with the shaft by the use of a cotter pin which passes through both of them. A wooden handle is fastened to the crank with a bolt. Since the blades are dangerously sharp, the support for the shaft is made into a case of wood and sheet metal, which covers the sharpening disk completely. When the sharpener is assembled, the shaft is placed through holes drilled in the sides of the case, and is held from slipping sidewise by washers and cotter pins.

The pencils are fed to the blades through a short metal tube, which is attached to the case by a small piece of tin, some solder, and tacks, at such an angle that the end of the pencil comes under the blades at the proper position for sharpening. This tube should be 5/16 in. inside diameter, to enable pencils of all ordinary sizes to slip down, so that they can be turned freely. No arrangement is made for turning the pencil, as this would make the construction too complex; the operator can easily turn the pencil by hand while sharpening it. He should not start turning the handle vigorously until he is certain that the pencil has been thrust no farther than the right depth; by a little experimenting he can tell its position from the resistance which it offers to the blade.

For the base, a cigar box is preferable, as it is just the right size. The lid is nailed down tight, and one end is cut out, so that a small drawer may be fitted, in which the shavings drop so as to be easily removable. For a drawer handle, use a small screw eye, a round-headed bolt and nut, or even a spool. When the case is screwed to the top of the box, the sharpener may be painted, and is then ready for use. If desired, the device may



Four Old Safety Razor Blades, Fastened to a Wooden Disk, Return to Usefulness as a Practical Pencil Sharpener

be fastened to the top of a desk or table with screws or a clamp.

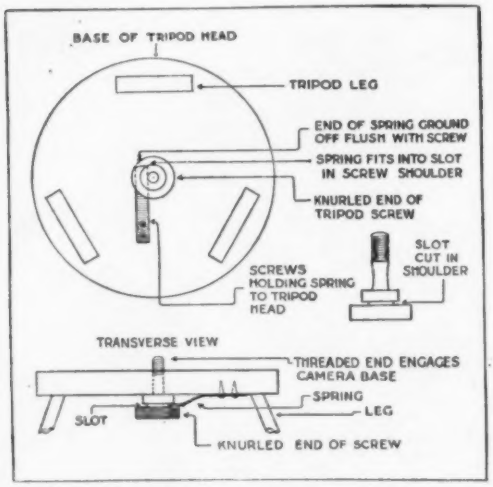
Shades Made from Paper Cartons

Attractive shades for incandescent lamps can be made from cartons of the kind commonly used to pack cereal foods and other groceries. These cartons may be round or rectangular, and either shape can be given a very ornamental appearance with very little trouble.

In the bottom of a box cut a central hole of the same diameter as the neck of the globe, so that, when the latter is unscrewed and the carton fitted to the socket, the shade will be held firmly in place when the globe is once more in position. Before cutting the design on the carton, it is a good plan to cover it with white paper, on which pencil marks can be easily made. Scrollwork of almost any variety is possible, the only condition being that sufficient solid card must be left to give strength to the shade. After the design has been cut, paint the outside of the lantern with gold or silver paint, and paste pieces of brightly colored tissue paper inside, using several tints. Then fix the shade on the socket, and screw the globe into position.

To Prevent Loss of Tripod Screw

Nearly every photographer has had the vexing experience of finding that he has lost the screw out of the head of his



The Screw is Held by a Spring, So That It may be Turned Freely to Attach the Camera, but cannot Fall Out

tripod about the time he is ready to "set up" for some shot that cannot be secured without it. Like most of the rest, I had this experience once, then decided not to get caught again in the same manner.

The screw was taken out of the head and put in the lathe, and a groove was turned just below the head, as shown in the sketch. A length of clock spring was then ground to engage with the groove in the screw, as illustrated. Holes for two screws are best punched in the spring, without annealing. A study of the assembly drawing makes it plain that the tripod-head screw thus attached cannot fall out.—John Edwin Hogg, Los Angeles, California.

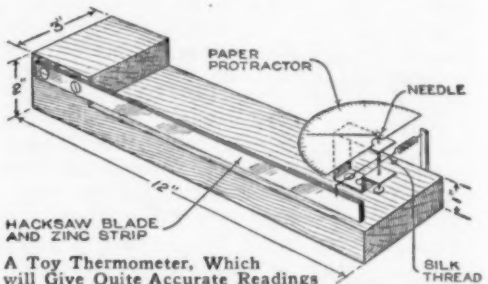
A Metal-Expansion Thermometer

The illustration shows a metal-expansion thermometer which any boy can construct from simple materials. First cut a block to the size indicated. Obtain an old 10-in. hacksaw blade, and get from a hardware store a strip of zinc of the same dimensions as the saw blade. With a gas flame, draw the temper at one end of the blade, so that two screw holes can be drilled. Solder the steel and zinc strips together, and screw them to the block, as shown.

A sewing needle is then mounted in a strip of tin cut from an old can, as indicated. The holes for the needle are made with a small, sharp nail, and the needle should fit quite snugly. A silk thread is fastened to the free end of the zinc-steel strip, then wound around the needle several times, and carried over to a spring which is attached at the other side of the block. The spring may be made by winding small wire, of steel, brass, or any other springy metal, around a nail, then slipping it off and bending hooks on the ends. A second needle is attached by means of solder, or sealing wax, to the top of the first needle, to act as a pointer.

A dial on which the temperature is read is glued to the tin strip underneath this pointer. The dial may be merely a paper protractor, marked in angular degrees; a table is then made showing what temperature is indicated by each degree mark. Or by comparing the instrument with a good mercury thermometer at various temperatures, pencil marks can be made on the dial, to read directly the degrees of temperature.

The operation of the instrument depends, of course, on the principle commonly used in thermostats: unequal expansion of metals such as steel and zinc. A drop of thin oil placed on the bearings of the vertical needle will be an improvement, and the thread should also be soaked in oil to prevent alterations



A Toy Thermometer, Which will Give Quite Accurate Readings of Temperature, is Made from Some Strips of Steel and Zinc, Operating, by Metal Expansion, a Pointer over a Dial

in its length, which would arise from varying amounts of moisture absorbed from the air.—L. Pyle, St. Louis, Mo.

The Comical Melting Teaspoon

A great deal of amusement is afforded by fusible teaspoons, which may be made as follows:

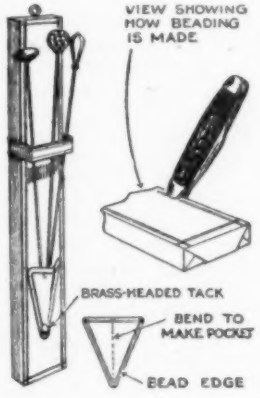
Melt about 4 oz. of bismuth in a crucible, and when fused, throw in 2½ oz.

of lead and 1½ oz. of tin. These metals will combine and form an alloy that will melt at a very low temperature. Form some of this into teaspoons, by the use of a mold, formed in clay or plaster of Paris from an ordinary spoon. They have a bright appearance, and if well made, will not easily be distinguished from other spoons.

Placed in a cup of tea, such a spoon will slowly melt and sink to the bottom of the cup; or if the tea is not hot enough to melt it, it will bend considerably, to the astonishment of the victim. Care should be taken, of course, to see that he does not forget there was a spoon in the cup, and take the melted metal in his mouth—which, however, he is not likely to do.—M. W. Hale, Osborne, Kan.

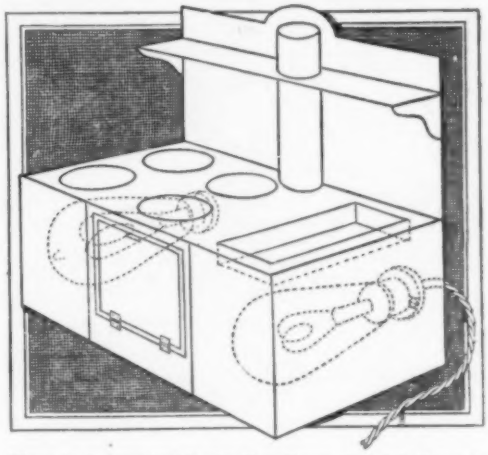
An Easily Made Hatpin Holder

A very useful gift which a boy of mechanical bent can make for his mother or sister is shown in the picture. A 15-in. piece of common lath forms the body of the hatpin holder, and it is covered by very thin brass, about No. 30 gauge. This brass can be handled almost as easily as heavy paper. Cover the lath with this brass, using it just like wrapping paper. Secure the edges firmly on the back by means of a few smooth tacks. Smooth down irregular corners with a light hammer. A pretty beading can be added by running the edge of a closed pocketknife along the edges of the "package," as shown. The sharp ends of the pins rest in a little V-shaped compartment, which may be cut from the same thin brass. The edges are beaded with the pocketknife, and the piece is tacked to the brass-covered lath with a small brass-headed tack. A loop of the thin brass is fastened around farther up, in much the same way, to keep the pins from falling over. Put a small screw eye in the top of the lath, clean the brass with brass polish, and paste on a neat paper back to cover the tacks.—F. H. Sweet, Waynesboro, Virginia.



A Toy Stove That Really Cooks

The average girl soon becomes disgusted with the ordinary toy cookstove, because it is merely a make-believe which



Electric Lamps inside the Toy Stove Furnish Enough Heat to Cook Something More Than Mud Pies

looks more or less like a stove, but never is hot. But let her see the heat circles rising from the stove, and she will never tire of it.

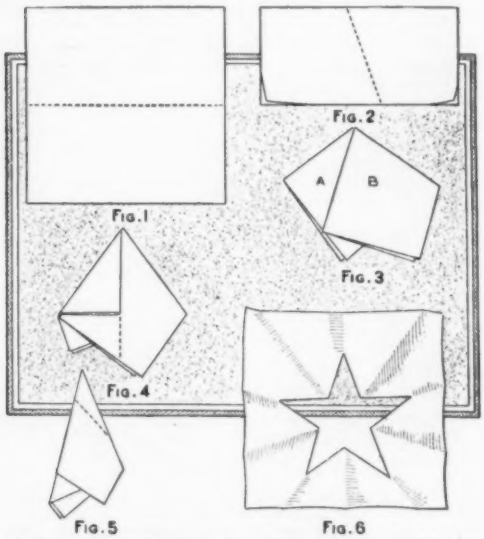
To convert the common toy from heatless to electric is not usually satisfactory, since the toy was not made for such use. But an easily made electric toy stove is within reach of most people. The material used for the stove itself is sheet iron, with the corners crimped or riveted together. Only the heating surfaces of the stove should become very hot; so, all others are lined inside with asbestos sheeting or asbestos paper. All the heat is supplied by two 25-watt electric lamps, or, if the reservoir is not really to be heated, one lamp will be sufficient. If the illusion is to be so complete that small cooking operations can be carried on, then the lamp under the cooking top should be a 32-cp., carbon-filament lamp, consuming about 80 watts.

The so-called "pigtail" sockets are best for the stove use, and should be connected to an ordinary plug by means of heater or electric-iron cord.

¶In a new tobacco pipe, and sometimes in an old one, the joint between the bit and the stem may become so tight as to make removal of the bit quite difficult. A simple remedy is to coat the joint with graphite, which is applied by rubbing it with a soft lead pencil.

A Five-Pointed Star with One Cut

To make a five-pointed star with a single snip of the shears is not hard if the



To Cut a Five-Pointed Star Out of Paper, with One Cut of the Scissors, Is Not Hard after a Little Practice

paper is first folded in the manner indicated in the illustration.

Begin by folding over a square along the center line, as shown in Fig. 1. It is now half as wide, as in Fig. 2, and should be folded again along the line as shown. The corner A, seen in Fig. 3, is next folded over against B, so that the piece appears as in Fig. 4. Folding once more along the dotted line, also shown in Fig. 4, the piece of paper will appear as in Fig. 5. Now cut along the line shown in Fig. 5. In the paper, when unfolded, will be a perfect five-pointed star. The right angles for folding and cutting, so as to bring the points of the star straight, as shown, will have to be found by experiment.

Print Trimmer Opens Mail

In an establishment where there was a large amount of mail, opening it in the usual manner required too much time, and it was not thought wise to buy an envelope opener, so one of the office force volunteered the use of his print trimmer. This made an excellent opener, and the contents were uninjured if they were shaken to one end before cutting the envelope open. As many as 500 envelopes per hour were opened in this way.—Frederick C. Davis, St. Joseph, Mo.

Testing Heat Absorption

It is well known that the various colors absorb heat at different rates. This may be shown graphically by laying small squares of cloth of different colors on the snow where the sun will strike them directly. After some little time they may be examined, and the following results observed: White cloth will remain in the same position, practically. Light blue and yellow squares will absorb enough heat to melt the snow, causing them to sink slightly. Red will sink farther, and black will bury itself until the rays of the sun can no longer reach it. The colors which sink fastest in the snow are those which absorb the most heat, and reflect the least.

Sign Writing with a Ruling Pen

A very satisfactory lettering tool for rapid work on small price cards, bulletins, or signs can be made by inserting a small pad of felt between the points of a ruling pen. The felt should be trimmed as close to the metal as possible. This device, used with India ink and a brass-edged ruler, produces neat work easily and quickly.—Y. K. Stoddard, San Diego, Calif.

Why does an Engine Need a Breather?

Nearly all automobile enthusiasts know that the function of the breather pipe on a four-cylinder gasoline engine is to provide compensation for changes of air pressure in the crank case, but it is surprising how few of them know more than the general principle of its purpose. In a single-cylinder engine it is obvious that the descending piston must compress the air in the crank case, and that some method of keeping the pressure uniform is necessary. But with a four-cylinder engine it is less apparent. Two pistons descend while two ascend, and they all move through exactly the same distance. It would seem, therefore, that the vacuum caused by the two ascending pistons compensated exactly for the compression caused by the two others, and that the resulting equilibrium made the breather unnecessary.

The answer is that, at a certain period in each revolution of the crankshaft, the two descending pistons are traveling faster than the two ascending ones, and that at another period the reverse is taking place. In the first case, the air in the crank case is compressed, and in the

latter a slight vacuum is created. As the crankpin moves from upper dead center through a quarter of a revolution, the web changes from a vertical to a horizontal position. When this happens, the piston apparently makes one-half of its downward stroke. But it really does more than this. The crankpin has not only moved downward; it has also moved outward, and the lower end of the piston rod has moved with it. The wrist pin, which is connected to the piston rod, travels downward as far as the crankpin does, but this is not enough to take care of the outward movement of the crankpin; it must travel a little lower yet, to allow for the sideward motion of the crankshaft. And, as the piston travels the same distance as the wrist pin, it makes a little more than one-half of its downward stroke during the quarter revolution of the crankshaft which has just been followed.

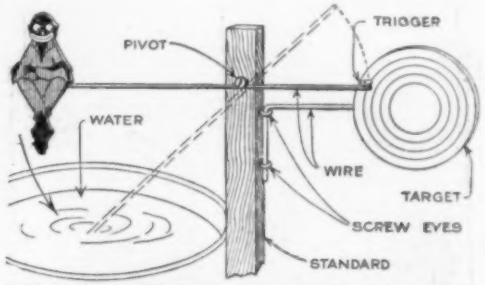
During the next quarter revolution, the piston moves slower, while the web moves to lower dead center and takes up a vertical position. In the entire half revolution, the wrist pin drops exactly the same distance as the crankpin, but as the greater part of its travel is accomplished in the first quarter, it must lag a trifle during the second quarter, while the crankpin moves inward as well as downward. In other words, the wrist pin travels faster in a downward direction than the crankpin does at the beginning of the stroke, and therefore "catches up" on it—in a vertical direction. Accordingly it has not so far to go in the second part of the downward stroke, and must therefore slow up, so that they may both finish the same distance apart.

If this has been understood, it will be easily seen that the piston makes less than half of its upward stroke during the third quarter revolution of the crankshaft, and must therefore speed up during the fourth quarter. It follows, then, that during the third quarter revolution the two ascending pistons travel more slowly than the two descending ones, so that the former do not create sufficient vacuum to compensate for the compression in the crank case caused by the latter. During the fourth quarter the reverse is true, and there is too much vacuum.

The above reasoning will demonstrate that the breather has exhaled during the first and third quarter revolutions, and inhaled during the second and fourth.—Howard Greene, Cliffside, N. J.

"Drop the Chocolate Drop" Target

To be dropped into a tub of cold water whenever the target is hit, is the fate

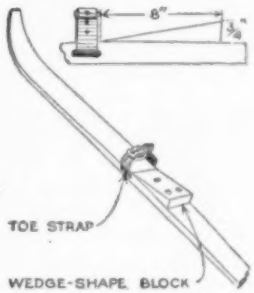


A Very Simple Mechanism Provides Sure Proof That the Target has been Hit, and Creates a Great Deal of Fun at the Same Time

of this manikin. Target and manikin are cut from a thin wooden board. The target disk is fitted with a wire arm, which turns in two screw eyes fixed to an upright standard. A length of wire, with a loop at the center, serves as a seat. A nail, put through the loop, pivots the seat piece to the standard. A brad, driven into the edge of the target, forms a trigger to hold the free end of the seat wire. With the manikin slipped on its seat, and the trigger set, the marksman may step right up, and try his skill with either a bean shooter or a rubber-band gun.

A Simple Ski Binder

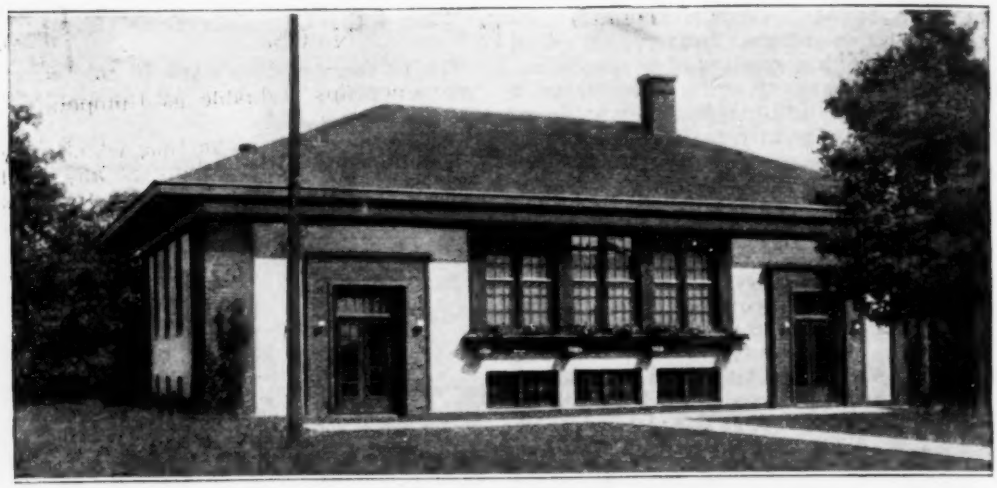
A ski binder made from a toe strap, used with the tapered block shown in the drawing, permits quick removal of the foot from the strap, and holds the ski on the foot when the course leads uphill.



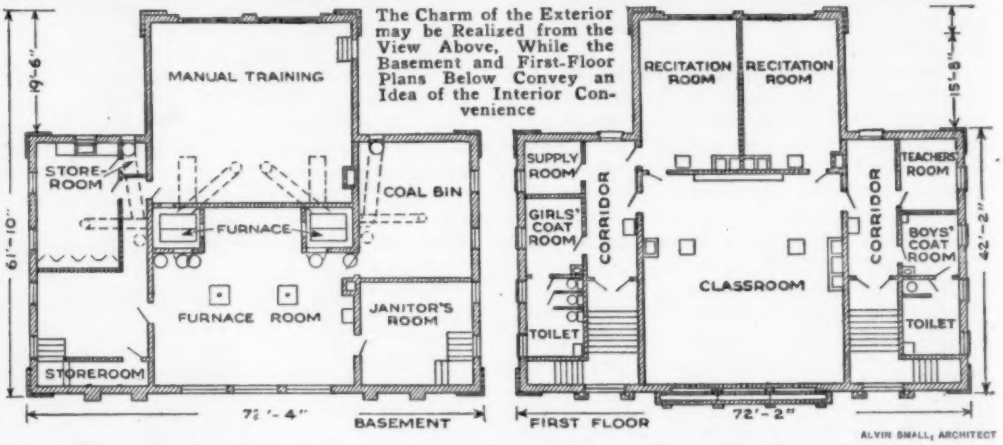
Cleaning Paint Spots from Glass

Small spots of paint which have dried on window panes, or other glass, may be quickly removed by holding a copper washer under the end of the finger, and rubbing it over the glass. The spots are quickly rubbed off, after which the grease mark is washed off in the usual way. Copper pennies, or even iron washers, may be used, but the copper washer is better than either of these.

COUNTRY SCHOOL MATERIALIZES IDEAL



The Charm of the Exterior may be Realized from the View Above, While the Basement and First-Floor Plans Below Convey an Idea of the Interior Convenience



ALVIN SMALL, ARCHITECT

ON a certain country highway in Dane County, Wis., stands a rural schoolhouse so unusual that it attracts the eye of every passing motorist. The structure is of hollow tile finished in rough, gray cement, trimmed with dark-red paving brick, and has an overhanging shingle roof. Touches of beauty are added by the brown-stained woodwork, a pair of lamps at each doorway, climbing vines, and a brown flower box, bracketed under the six front windows and filled with geraniums.

The school yard is a triangular plot facing the road. The neatly kept lawn has been landscaped with perennials and shrubbery at a cost of $100. Nature supplied enough trees, and the only addition is a flagpole and a safety sign at the roadside. A plan not yet carried out calls for a cement platform, about 50 by 80 ft., with a low wall, for games and exercises in the back yard. About 40 children occupy the building daytimes, and at night, on occasion, it becomes a community center. Two teachers are employed at $100 and $80 a month, and a janitor gives part of his time for $600 a year. Some of the seats are movable, so the floor can be cleared; there is a piano, and the big bookcase holds about $150 worth of books. Stereoscopes with some 600 views are part of the equipment, and there is an electric lantern with a floor connection, and a screen suspended from the picture molding.

In the basement is a kitchen and pantry, and a large room with a sewing machine, and provisions for playing, eating, or studying. The plumbing arrangements are all modern. There are two large furnaces incased in brick, and a ventilating system. The building is so planned that a wing may be added at each end, and extra rooms at the rear. It cost $15,000 to build a little more than two years ago.